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POTENTIAL HEALTH HAZARDS

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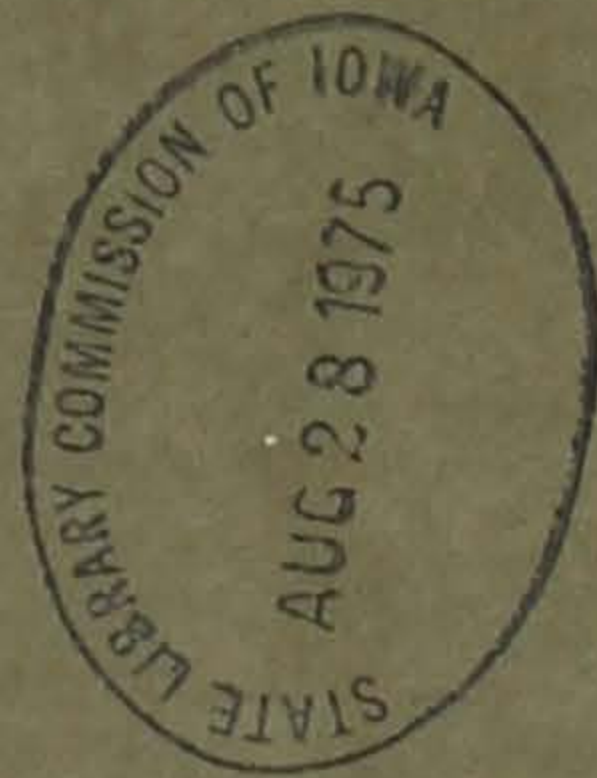
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I O W A
C R A F T
P R O J E C T
Des Moines, Iowa
WORK PROJECTS
ADMINISTRATION

Des Moines, Iowa, 8/28/75, 12051

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State of Iowa

Department of Health

Des Moines

October 11, 1933.

DIVISION OF
PUBLIC HEALTH ENGINEERING
AND INDUSTRIAL HYGIENE

POTENTIAL HEALTH HAZARDS

AND

WELFARE FACILITIES

Walter L. Biering, M. D.,
Commissioner,
State Department of Health, IN
State House.

Dear Dr. Biering: IOWA INDUSTRIES

Submitted herewith for your consideration is the report of a preliminary survey of industrial establishments in the State which was conducted for the purpose of evaluating the industrial hygiene problems of Iowa.

This survey was begun shortly after the Division of Industrial Hygiene was established on July 1, 1932, and was conducted along with routine activities of the division during the period ending July 1, 1933. All visits to industrial plants necessitated by this survey were made by the writers.

Respectfully submitted,

F. J. Bremer

F. J. Bremer,

Industrial Hygiene Engineer.

DIVISION OF INDUSTRIAL HYGIENE

IOWA STATE DEPARTMENT OF HEALTH

W. L. Campbell
W. L. Campbell,
Chemical Engineer.

State of Iowa

Department of Health

Des Moines

WALTER L. BIERRING, M. D.
COMMISSIONER

DIVISION OF
PUBLIC HEALTH ENGINEERING
AND INDUSTRIAL HYGIENE

October 11, 1939.

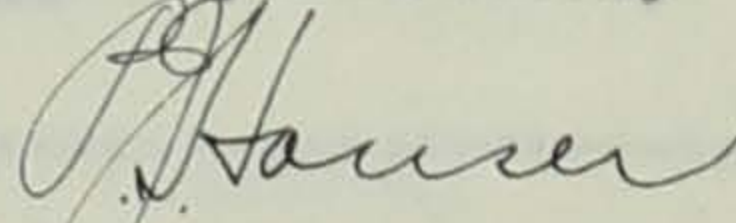
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Commissioner,
State Department of Health,
State House,

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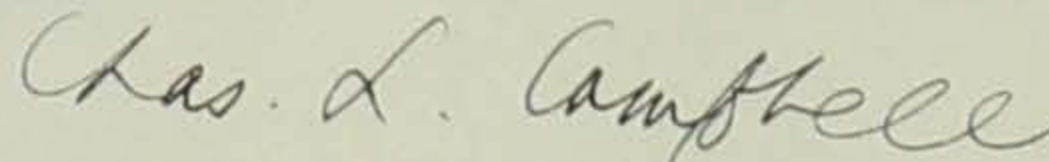
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Respectfully submitted,



P. J. Houser,
Industrial Hygiene Engineer.



Chas. L. Campbell,
Chemical Engineer.

PJH:AM
Enc.

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ABSTRACT

This report presents the results of a preliminary survey of Iowa industrial establishments in which information was collected from a representative sample of workers engaged in the mining, manufacturing and mechanical industries and the laundry and dry cleaning service groups. The data collected are presented in various tables showing where potential occupational disease hazards were found. As has been reported in other States, there is a large number of exposures to various harmful materials and a definite lack of industrial welfare service, indicating an apparent need for industrial hygiene service for Iowa industries, especially the smaller plants.

IOWA STATE DEPARTMENT OF HEALTH

Division of Industrial Hygiene

FOREWORD

This survey was conducted primarily to acquaint the Division of Industrial Hygiene with the health problems in industry. It afforded an opportunity for observing various industrial operations and processes, the materials used and their possible effects upon the workroom environments. It also afforded an opportunity for learning to what extent industrial welfare facilities important to health are available to the industrial workers of Iowa, and for presenting a program of industrial hygiene to industrial management.

The data were collected through visual observation only and no definite opinions are ventured as to whether conditions are good or bad. These data, however, do indicate the general setup in Iowa and the potential problems of the group.

This report should not be interpreted as necessarily indicating that conditions now existing are unhealthful, but should be used as a basis for further efforts in maintaining a permanent industrial hygiene program.

Determination of atmospheric concentration of dusts, gases, vapors, and fumes.

Analysis of materials used in manufacturing and mechanical processes.

IOWA STATE DEPARTMENT OF HEALTH

Division of Industrial Hygiene

PURPOSE

To assist industries in preventing and controlling occupational diseases and attaining a higher health level among the working population.

SERVICES

I. GENERAL

Determination of potential health hazards in industrial establishments by plant surveys.

Determination of extent of hazards by detailed studies of hazardous processes.

Investigation of reports of occupational disease cases.

Cooperation with other interested official and nonofficial agencies.

Education of industrial management, labor, professional, and lay groups on industrial hygiene matters.

II. ENGINEERING AND CHEMICAL

Collection and analysis of air samples from workrooms.

Determination of atmospheric concentration of dusts, gases, vapors, and fumes.

Analysis of materials used in manufacturing and mechanical processes.

POTENTIAL HEALTH HAZARDS AND WELFARE FACILITIES IN IRON INDUSTRIES

Investigation of water supply and waste disposal systems,
ventilation and illumination.

Advice on proper control measures.

III. MEDICAL (Proposed for future)

Consultation in diagnosis and treatment of occupational
diseases.

Physical and x-ray examinations in special studies as
requested.

Study of sickness and absenteeism reports in industry.

These studies have been carried out as a part of the program of the health of the industrial worker. The results of these studies have been published in the form of reports and bulletins. The following are some of the findings of these studies:

The first study was a survey of the health of iron workers. This study was conducted by the National Institute of Health and was published in 1937. The results of this study showed that occupational diseases are associated with many processes in industry and that the life expectancy of the industrial worker is several years less than the worker who does not work in industry. Also, that the incidence of tuberculosis, pneumonia, and the degenerative diseases is increased materially among industrial workers, reaching an increase in the corresponding rates for the general population. In consideration, therefore, of the number of persons involved, it at once became apparent that the searching out and control of occupational diseases and the improvement of health among the working population is one of major public health significance.

On July 1, 1937, a Division of Industrial Hygiene was set up as a unit of the Public Health Engineering Division, State Department.

POTENTIAL HEALTH HAZARDS AND WELFARE FACILITIES IN IOWA INDUSTRIES

INTRODUCTION

Industrial Hygiene has been defined as a system of principles or rules designed for the promotion of the health of our industrial population. It involves not only the specific occupational diseases but all phases of the industrial environment that may have an effect upon the health of the worker.

The U. S. Census for 1930 reveals that at that time there were 912,832 gainful workers in the State, and that more than 185,000 were employed in the manufacturing, mining, and other industries which harbor potential health hazards. Studies conducted by the National Institute of Health and experiences elsewhere show that occupational diseases are associated with many processes in industry and that the life expectancy of the industrial worker is several years less than the worker otherwise engaged. Also, that the incidence of tuberculosis, pneumonia, and the degenerative diseases is increased materially among industrial workers, causing an increase in the corresponding rates for the general population. In consideration, therefore, of the number of persons involved, it at once becomes apparent that the searching out and control of occupational diseases and the improvement of health among the working population is one of major public health significance.

On July 1, 1937, a Division of Industrial Hygiene was set up as a unit of the Public Health Engineering Division, State Depart-

ment of Health. The organization was made possible partially by funds contributed through the National Social Security Act and partially by funds advanced by the State. The adopted policy of the division is one of service to industry by assisting in controlling occupational diseases and in attaining a higher health level among the workers. Although safety against accidental injury is of paramount importance in any industrial process, a safety program must not stop with protection against accidents. The chronic effects of various materials and conditions are equally important in combating disease and improving health. A complete program must therefore deal with such subjects as dusts, gases, vapors and fumes, extreme temperatures, abnormal humidities, illumination, ventilation, noise, water supply and waste disposal, communicable diseases, medical and nursing service, and personal hygiene. Elimination of the detrimental effects of these materials and conditions in industry will not only improve the health of the working people but is bound to reflect upon the health level of the general population.

There are at present three other State agencies concerned with the safety and health of people engaged in industry. Two of these agencies, namely, the State Labor Commissioner and the State Mine Inspector, are responsible for the enforcement of laws pertaining to safety of working places and make periodic inspections of factory workrooms, fire escapes, passenger and freight elevators, and mining operations. The third agency, namely, the State Industrial Commissioner, is concerned with administration of the workmen's com-

compensation law. Reports of injuries are made to the industrial commissioner and compensation settlements must have his approval. Personal injuries sustained by an employee arising out of and in the course of the employment are compensable, but a disease, unless it shall result from the injury, is not to be construed as a personal injury.

One of the objectives of the Department of Health is to cooperate with these agencies in improving workroom environments by serving in an advisory capacity on matters pertaining to health.

In order to effectively carry on a program of industrial hygiene in an area, it is first necessary to obtain a definite knowledge of the problems of that area. Information on existing conditions in regard to the number of persons exposed to various toxic materials used in industrial processes, the methods in effect for controlling or preventing undue exposure, and the facilities available for medical care, is essential for the inauguration of a well-balanced program. In addition, it is necessary that industrial managers become acquainted with the program so that they may be cognizant of the problems involved and the services available for eliminating occupational disease and promoting better health among the working population.

A preliminary survey of the industrial area is, therefore, the first step to be undertaken as it affords the dual opportunity of obtaining pertinent information and of introducing the program to industry by personal contacts with representative groups.

Presented herewith is a compilation and discussion of the information obtained by means of such a survey in Iowa. It contains data in regard to welfare facilities, exposures to various materials, and control measures employed. The data on exposures, however, indicate only the potentialities of harmful conditions and the data on control measures indicate merely the existence of such and do not infer that they were adequate or proper.

ACKNOWLEDGMENTS

As a whole, it may be said that the industrial hygiene program, as proposed by this Department, was received in a fine spirit of cooperation by the industrial officials visited. The Iowa Manufacturing Association, through its secretary Mr. E. A. Kimball, was particularly cooperative. For this reception and the time and efforts extended in permitting pertinent data to be collected, grateful thanks and appreciation are extended. The efforts of the personnel, office of the State Labor Commissioner, State Mine Inspector and of the various Chambers of Commerce in the State who furnished lists of industrial establishments are also gratefully acknowledged. Thanks are also due Mr. J. J. Bloomfield, Sanitary Engineer, Mrs. Mary E. Peyton, Junior Chemist, and others on the staff of the Industrial Hygiene Division, U. S. Public Health Service who offered many valuable suggestions for the proper conduct of this survey.

SCOPE AND PLAN OF SURVEY

Since the primary purpose of the survey was to learn to what extent potential occupational disease hazards existed in industry, it was thought advisable to limit the survey to only those types of industries in which experiences elsewhere have shown them to be prevalent. Thus of the 912,632 persons engaged as industrial workers in the State, 779,664 were omitted from the survey because of their association with industries known to have a low incidence of occupational diseases. The remaining 133,168 workers are engaged in industries classified under Extraction of Minerals; Manufacturing and Mechanical; and laundries, dry cleaning and pressing shops under Domestic and Personal Service.

Obviously, a visit to all the plants in the groups selected for survey would have been advantageous. However, it was thought sufficient for the purpose to limit the survey to a relatively few plants, selected in such a way which would yield facts representative of the entire group. The plants selected for a visit were taken from a list of all industrial establishments in the State by random sampling. This procedure of sampling and the data obtained at each plant conformed with the suggestions of the U. S. Public Health Service and was based on experiences of similar surveys in other industrial areas of the United States.

A week or ten days before the survey a letter signed by the State Health Commissioner was sent to an official of the establishment briefly explaining the purpose of the survey and stating generally the

type of information to be obtained. All surveys were made by the regular personnel of the division.

Figure 1 is a map of the State showing the location of manufacturing areas according to number of persons engaged. Figure 2 shows the location of coal mining areas and Figure 3 shows the counties in which one or more surveys were made.

Two distinct classes of data were obtained at each plant visited on forms shown in Appendixes i and ii. The first form pertains to industrial welfare conditions and lists the name and location of the establishment, safety and medical provisions, whether or not sickness records are available, and the total number of employees engaged on production. The second form pertains to the workroom environment and lists the number of workers engaged in each occupation, a brief statement as to the nature of the work associated with each occupation, the materials and by-products associated with the process and the methods employed in protecting against unfavorable conditions. Periodically throughout the survey the forms were edited, the plant coded according to products manufactured, and exposures classified according to the schedule of materials appearing in Appendixes iii and iv.

The number of persons ten years old and over engaged as gainful workers in the various industry groups as taken from the U. S. Census of 1930 is shown in Table 1. This table also shows the proportionate number of persons in each group covered by the survey. In some cases the sample represented less than one percent of the workers in the group; in other cases the sample exceeded the U. S.

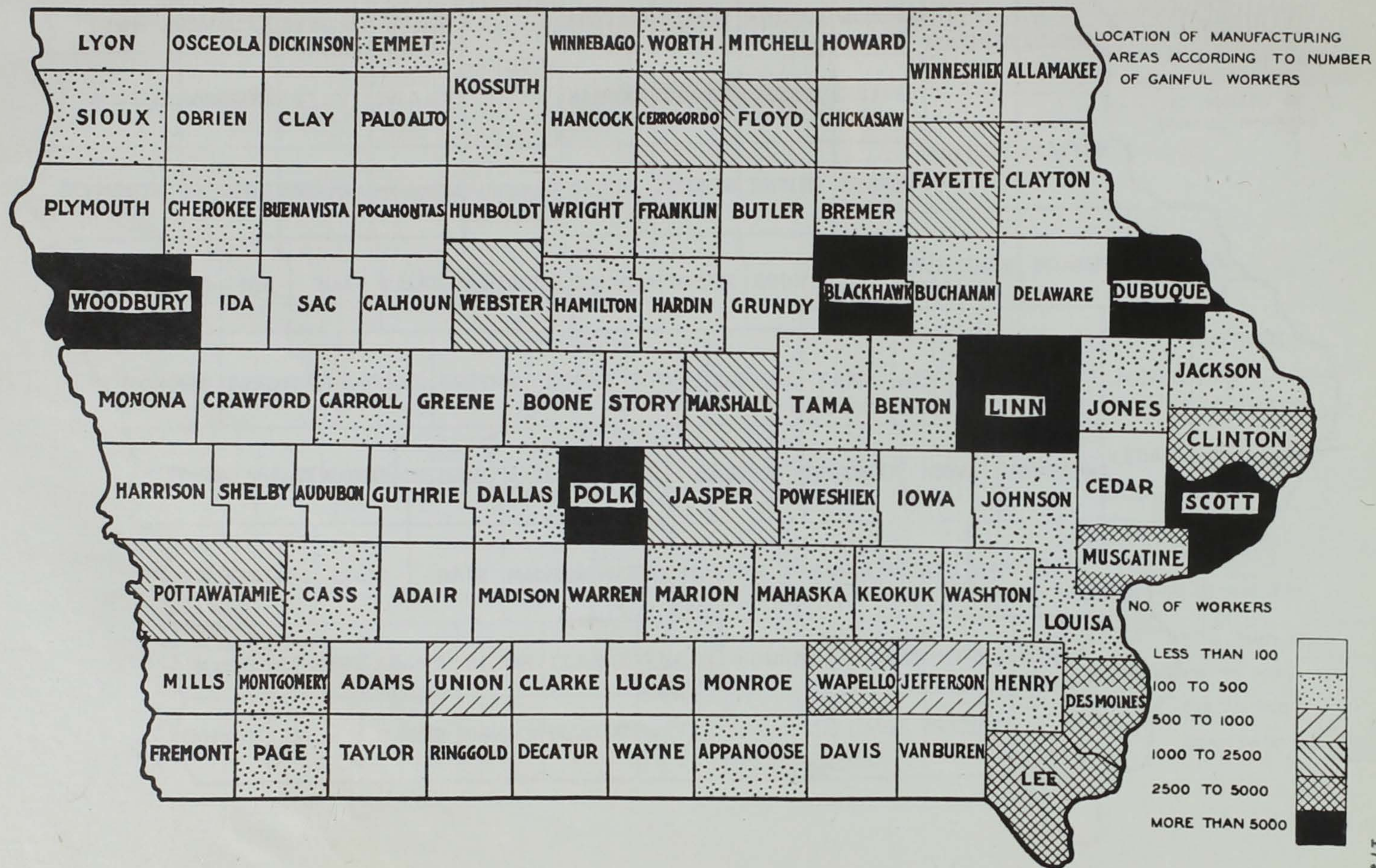


FIG. 1

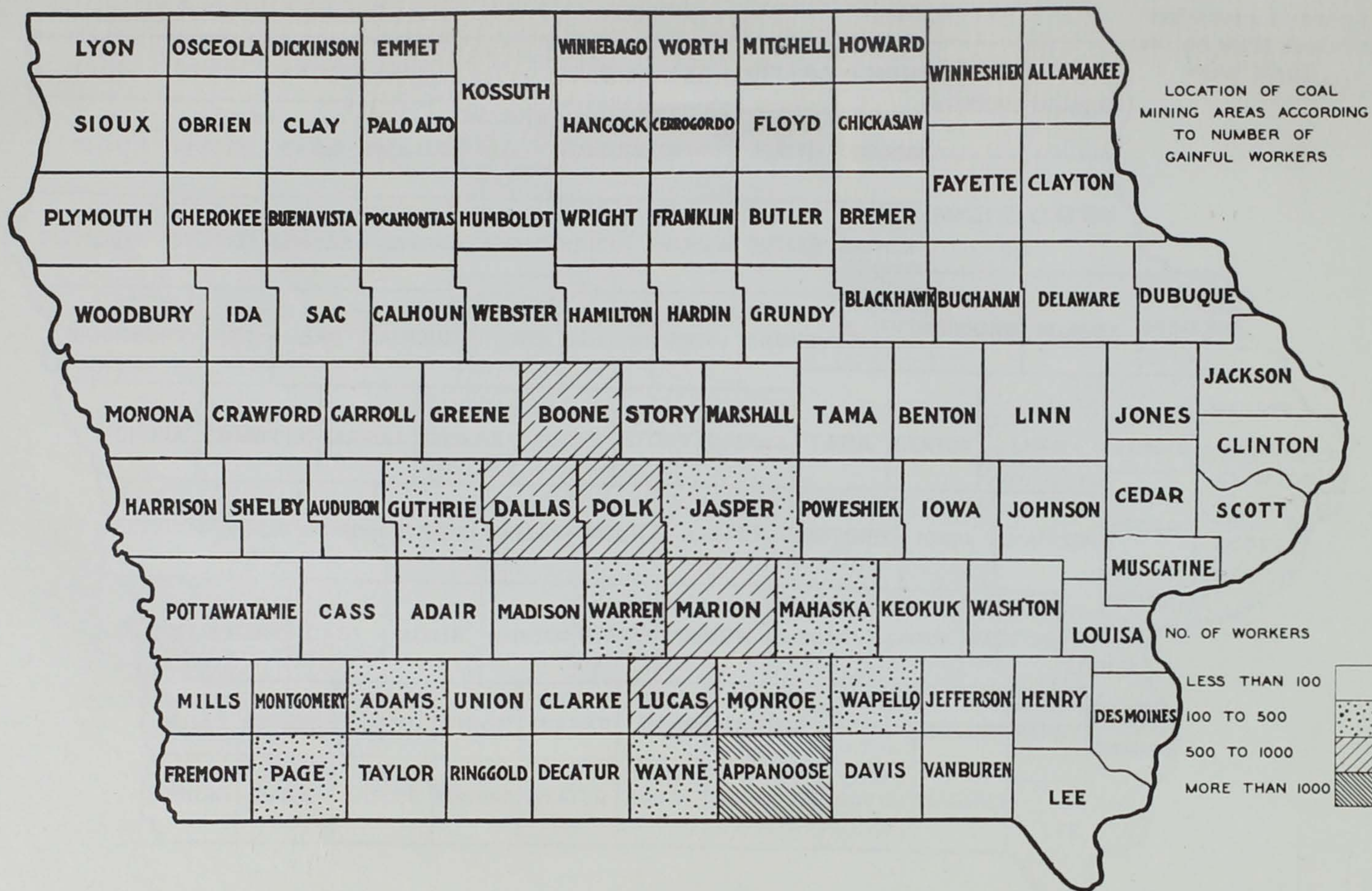


FIG. 2

COUNTIES IN WHICH
ONE OR MORE SURVEYS
WERE MADE

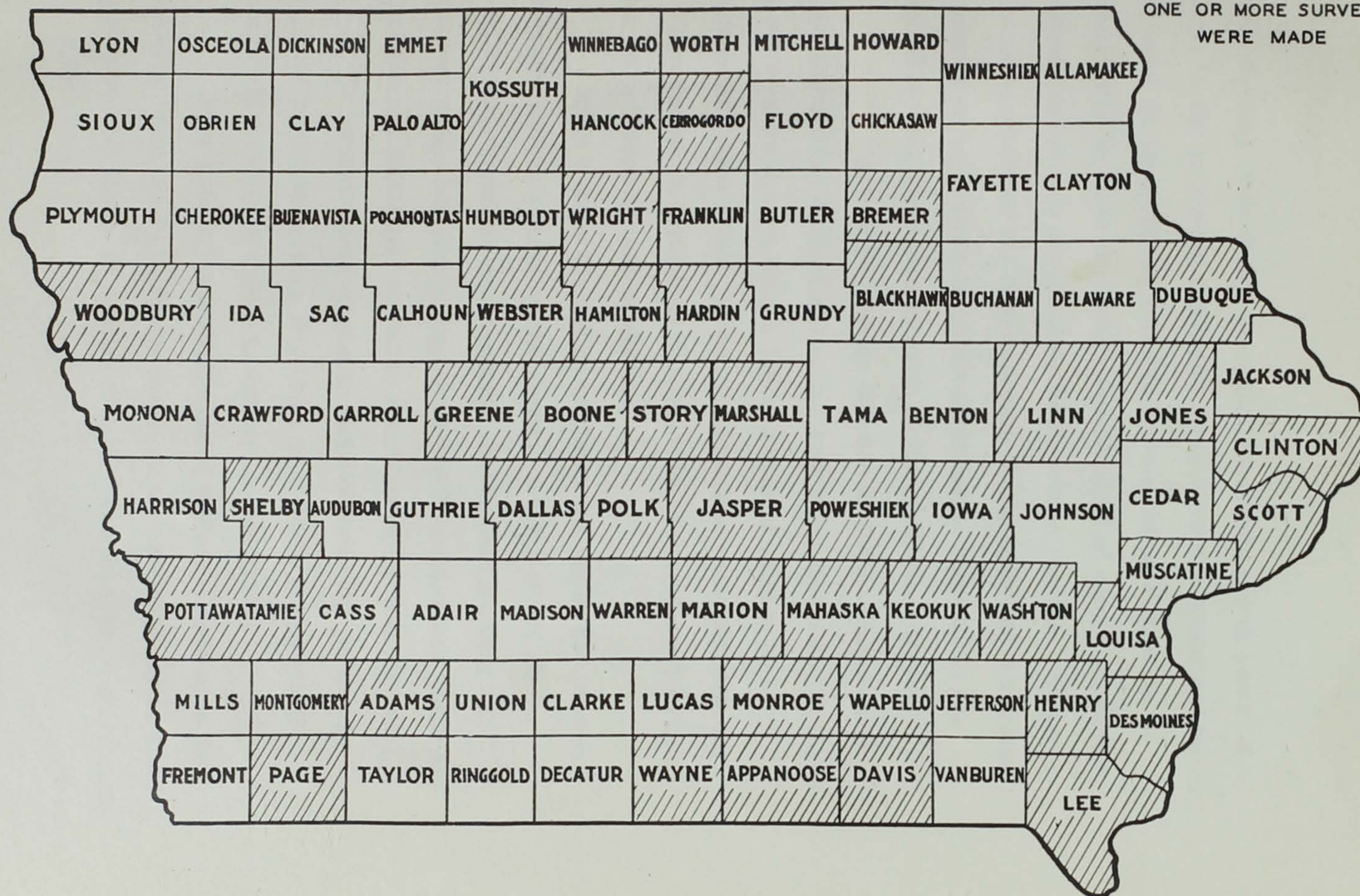


FIG. 3

TABLE 1

COMPARISON OF CENSUS FIGURES IN INDUSTRIAL GROUPS SHOWING NUMBER
AND PERCENTAGE COVERED BY THE SURVEY

Census Figures. This disagreement was undoubtedly due to personnel changes in the particular industrial group since the census was taken. In several instances plants selected for a visit were found to be closed, while in other instances establishments of recent origin were discovered which were not included in the census figures. Obviously, an accurate record of all establishments in the State and the number of persons employed would be difficult to keep. Hence there are bound to be some minor discrepancies in the population figures.

In selecting the plants, the size of sample was governed by the probability of hazardous occupations being involved. It was therefore intended to include a larger number of persons in the hazardous occupations than in the less hazardous ones, although due to discrepancies in population figures, this is not apparent in all cases as indicated by this tabulation.

Table 2 shows the number of plants and the number of male and female workers covered by the survey. A total of 414 plants employing 28,170 workers was visited. In the manufacturing and mechanical group, 359 plants, employing 27,011 workers were visited; 101 plants and 10,912 persons being classified under iron and steel. This is the largest number of plants surveyed under any particular group, the reason being that this class of industry probably presents the most varied problems in industrial sanitation.

Table 3 shows the distribution of workers according to size of plants. From the U. S. Census report of manufacturers (as of 1929) it is shown that there is a total of 3,317 manufacturing establishments

TABLE 1

DISTRIBUTION OF GAINFUL WORKERS IN INDUSTRIAL GROUPS SHOWING NUMBER
AND PERCENTAGE COVERED BY THE SURVEY

INDUSTRY GROUP	Total Gainful Workers 1930 Census	Workers Covered by Survey	Workers Covered by Survey
		Number	Percent of Total
TOTAL POPULATION	2,470,939		
Gainful Workers (all industries)	912,832		
Gainful Workers (groups covered by survey)	133,168	28,170	21.2
AGRICULTURE	331,151	0	0.0
FORESTRY & FISHING	808	0	0.0
EXTRACTION OF MINERALS	9,524	596	6.3
Coal Mines	7,759	463	6.0
Other Extraction of Minerals	1,765	133	7.5
MANUFACTURING & MECHANICAL	157,623	27,011	17.1
Building Industry	37,527	0	0.0
Chemical & Allied Industries	4,445	844	19.0
Explosives & Fireworks	110	79	71.8
Gas Works	1,043	107	10.0
Paint & Varnish	44	15	33.3
Soap	53	170	100.0 + *
Other Chemical	3,195	473	14.8
Cigar & Tobacco	588	2	0.3
Clay, Glass & Stone	5,324	1,771	33.3
Brick, Tile, & Terra Cotta	1,824	561	30.8
Glass	6	44	100.0 + *
Lime, Cement & Artificial Stone	3,310	1,119	33.8
Marble & Stone	184	47	24.5
Clothing	4,276	765	17.9
Gloves	358	325	90.8
Shirts, Suits & Other Clothing	3,918	440	11.5
Food & Allied	26,106	5,900	22.6
Bakeries	3,995	68	1.7
Dairy Products	3,390	106	3.1
Candy	1,110	209	18.7
Flour & Feed Mills	730	200	27.4
Canning & Preserving	2,010	146	7.3
Slaughter Houses & Meat Packing	11,462	3,208	27.8
Sugar & Corn Products	1,728	977	56.6
Other Foods & Ice	1,322	838	63.3
Liquor & Beverages	359	148	41.2

TABLE 1 (cont'd)

INDUSTRY GROUP	Total Gainful Workers 1930 Census	Workers Covered by Survey	Workers Covered by Survey
		Number	Percent of Total
MANUFACTURING & MECHANICAL (cont'd)			
Iron & Steel	52,047	10,912	34.0
Agricultural Implements	806	832	100.0 + *
Automobile Bodies & Parts	554	68	12.3
Automobile Repair Shops	6,419	53	0.8
Steel Rolling & Fabrication	790	324	41.0
Car & Railroad Shops	11,059	523	4.7
Other & Not Specified Iron & Steel	12,419	9,112	73.4
Metals Other Than Iron & Steel	1,435	169	11.8
Brass Mills & Foundries	90	153	100.0 + *
Other Metals	1,345	16	1.2
Leather	1,351	609	45.0
Harness & Saddlery	246	71	28.8
Miscellaneous Leather	420	141	33.3
Shoes	435	333	76.6
Tanneries	250	64	25.6
Lumber & Furniture	7,239	2,228	30.8
Furniture & Casket	2,228	233	10.5
Saw & Planing Mills	4,223	1,667	39.4
Other Woodworking	788	328	41.7
Paper, Printing & Allied	8,743	696	8.0
Paper & Pulp	768	218	27.6
Paper Box	333	47	14.1
Printing, Publishing & Engraving	7,642	431	5.6
Textile	1,780	109	6.1
Knitting Mills	488	4	0.8
Woolen & Worsted Mills	126	71	56.3
Tent & Awning	96	23	29.2
Mattress & Other	1,070	6	0.6
Miscellaneous Manufacturing	26,782	3,006	11.2
Broom & Brush	177	74	41.8
Buttons	2,480	802	32.3
Electric Light & Power	241	207	86.0
Electrical Machinery & Supply	1,986	465	23.4
Independent Hand Trades	2,588	5	0.2
Rubber Factories	513	296	57.6
Other Miscellaneous	18,777	1,157	6.2
TRANSPORTATION & COMMUNICATION	89,782	0	0.0

TABLE 1 (cont'd)

INDUSTRY GROUP	Total Gainful Workers 1930 Census	Workers Covered by Survey	Workers Covered by Survey
		Number	Percent of Total
TRADE	139,070	0	0.0
PUBLIC SERVICE (not elsewhere classified)	14,663	0	0.0
PROFESSIONAL SERVICE	74,341	0	0.0
DOMESTIC & PERSONAL SERVICE	69,321	563	0.8
Laundries	3,739	232	6.2
Dry Cleaning & Pressing Plants	1,406	331	23.6
Other	64,176	0	0.0
INDUSTRY NOT SPECIFIED	26,848	0	0.0

* 100 + percentage occurs when population of plants surveyed exceeds 1930 census figures for indicated industry.

TABLE 2

NUMBER OF PLANTS AND EMPLOYEES IN IOWA INDUSTRIES AND SERVICE GROUPS SURVEYED

INDUSTRY OR SERVICE GROUP	No. of Plants	Number of Workers		
		Total	Male	Female
EXTRACTION OF MINERALS				
Mining				
Bituminous Coal Mines	8	463	463	0
Gypsum Mines	2	133	133	0
Total for Extraction of Minerals.....	10	596	596	0
MANUFACTURING & MECHANICAL INDUSTRIES				
Chemical & Allied Industries				
Explosive & Fireworks	2	79	75	4
Gas Works	5	107	107	0
Paint & Varnish	4	15	15	0
Soap	3	170	117	53
Other Chemical	14	473	277	196
Total for Chemical & Allied Industries...	28	844	591	253
Cigar & Tobacco				
Cigar	1	2	2	0
Total for Cigar & Tobacco.....	1	2	2	0
Clay, Glass & Stone				
Brick, Tile & Terra Cotta	10	561	561	0
Glass	2	44	37	7
Lime, Cement & Artificial Stone	8	1,119	1,118	1
Marble & Stone	12	47	47	0
Total for Clay, Glass & Stone.....	32	1,771	1,763	8
Clothing				
Gloves	2	325	69	256
Shirts, Suits & Other Clothing	12	440	47	393
Total for Clothing.....	14	765	116	649
Food & Allied Industries				
Bakeries	4	68	68	0
Butter, Cheese & Milk Products	6	106	89	17
Candy	5	209	76	133
Flour & Feed Mills	7	200	163	37
Canning & Preserving	2	146	51	95
Slaughter & Packing Houses	7	3,208	2,619	589
Sugar, Starch & Corn Products	2	977	965	12
Other Foods	5	838	633	205
Liquor & Beverages	8	148	148	0
Total for Food & Allied.....	46	5,900	4,812	1,088

TABLE 2 (cont'd)

INDUSTRY OR SERVICE GROUP	No. of Plants	Number of Workers		
		Total	Male	Female
Iron & Steel				
Agricultural Implements	7	832	832	0
Automobile Bodies & Parts	5	68	67	1
Automobile Repair Shops	4	53	50	3
Steel Rolling & Fabrication	4	324	324	0
Car & Railroad Shops	5	523	523	0
Other & Not Specified Iron & Steel	76	9,112	8,978	134
Total for Iron & Steel.....	101	10,912	10,774	138
Metals Other Than Iron & Steel				
Brass Mills & Foundries	4	133	136	17
Other Metal Industries	3	16	14	2
Total for Other Metals.....	7	169	150	19
Leather				
Harness & Saddle	4	71	71	0
Miscellaneous Leather	2	141	37	104
Shoe Factories	3	333	158	175
Tanneries	2	64	37	27
Total for Leather.....	11	609	303	306
Lumber & Furniture				
Furniture & Casket	11	233	216	17
Saw & Planing Mills	11	1,667	1,667	0
Other Woodworking Factories	7	328	224	104
Total for Lumber & Furniture	29	2,228	2,107	121
Paper, Printing & Allied				
Paper & Pulp	3	218	216	2
Paper Box	2	47	18	29
Printing, Publishing & Engraving	25	431	353	78
Total for Paper, Printing & Allied.....	30	696	587	109
Textile				
Knitting Mills	1	4	2	2
Woolen & Worsted Mills	2	71	40	31
Awning & Tent	3	28	25	3
Mattress & Other Textile	4	6	6	0
Total for Textile.....	10	109	73	36

TABLE 2 (cont'd)

INDUSTRY OR SERVICE GROUP	No. of Plants	Number of Workers		
		Total	Male	Female
Miscellaneous Manufacturing				
Broom & Brush	5	74	41	33
Button Factories	12	802	351	451
Electric Light & Power	4	207	206	1
Electrical Machinery & Supply	6	465	207	258
Independent Hand Trades	2	5	5	0
Rubber Goods	4	296	280	16
Other Miscellaneous	17	1,157	579	578
Total for Miscellaneous Manufacturing....	50	3,006	1,669	1,337
Total for Manufacturing & Mechanical.....	359	27,011	22,947	4,064
DOMESTIC & PERSONAL SERVICE				
Personal Service				
Laundries	8	232	48	184
Dry Cleaning & Pressing Plants	37	331	176	155
Total for Domestic & Personal Service....	45	563	224	339
GRAND TOTAL.....	414	28,170	23,767	4,403

(exclusive of mechanical trades) in the State. Over 50% of these plants employ less than five persons and about one quarter employ from five to 20 persons. Thus more than 75% of the plants employ less than 20 persons, the remaining quarter employing from 21 to 2,500 or more persons.

In the coal mining industry, 36% of the plants employ less than five persons and 41.6% from five to 20. Here again approximately three-fourths of the plants employ less than 20 persons, the remaining 25% employing from 20 to 500. None of the mines has more than 500 employees and only 0.8% have more than 250 employees.

This table also shows the size distribution of plants surveyed. For example, of the 101 plants classified under iron and steel, 23.8% employed less than five persons, 27.7% employed from five to 20 persons, 14.8% from 21 to 50 persons, etc.

Table 4 likewise shows the size distribution of workers in both the total manufacturing and mining plants and the plants covered by the survey. From the U. S. Census report on the manufacturing industry, it is shown that 81,678 persons are employed in all the plants. Less than 6%, however, are in plants employing less than five persons and 4% are in plants with 2,500 or more employees. The remaining 90% are in plants employing from five to 2,500 persons and are distributed quite equally in the various groups.

In the coal mining industry, again only 6% of the 8,300 persons are employed in plants with less than five workers, the remaining 94% being in plants ranging in size from five to 500 workers.

TABLE 3

PERCENTAGE DISTRIBUTION OF SURVEYED PLANTS ACCORDING TO NUMBER OF WORKERS

INDUSTRY OR SERVICE	Percentage of Plants According to Number of Workers									
	Number of Plants	Less than 5	5 to 20	21 to 50	51 to 100	101 to 250	251 to 500	501 to 1000	1001 to 2500	2501 or more
U.S. Census for Iowa, Manufacturing*	3,317	58.1	23.8	8.9	4.8	2.6	0.8	0.5	0.2	0.1-
U.S. Census for Iowa, Coal Mining**	381	36.0	41.6	12.6	5.8	3.2	0.8	0.0	0.0	0.0
U.S. Census for Iowa, Both	3,698	56.0	25.7	9.4	4.9	2.7	0.8	0.5	0.2	0.1-
ALL INDUSTRIES STUDIES	414	28.2	31.3	17.4	10.4	8.2	2.4	1.2	0.7	0.2
EXTRACTION OF MINERALS	10	0.0	20.0	40.0	10.0	30.0	0.0	0.0	0.0	0.0
Bituminous Coal	8	--	25.0	37.5	--	37.5	--	--	--	--
Gypsum	2	--	--	50.0	50.0	--	--	--	--	--
MANUFACTURING & MECHANICAL	359	26.8	31.2	16.7	11.4	8.6	2.8	1.4	0.8	0.3
Chemical & Allied	28	35.6	32.1	14.3	10.7	7.2	--	--	--	--
Cigar & Tobacco	1	100.0	--	--	--	--	--	--	--	--
Clay, Glass & Stone	32	46.8	15.6	12.5	12.5	3.1	9.4	--	--	--
Clothing	14	35.7	14.3	14.3	21.4	7.1	7.1	--	--	--
Food & Allied	46	13.1	45.7	19.6	4.3	4.3	4.3	4.3	4.3	--
Iron & Steel	101	23.8	27.7	14.8	14.8	13.9	2.0	1.0	1.0	1.0
Metals Other Than Iron & Steel	8	42.9	28.5	14.3	14.3	--	--	--	--	--
Leather	11	9.1	27.2	27.2	18.2	18.2	--	--	--	--
Lumber & Furniture	29	27.6	34.1	27.6	6.9	6.9	3.4	3.4	--	--
Paper & Printing	30	10.0	53.3	30.0	3.3	3.3	--	--	--	--
Textile	10	60.0	30.0	--	10.0	--	--	--	--	--
Miscellaneous	51	27.4	31.4	9.8	15.7	11.8	2.0	2.0	--	--
DOMESTIC & PERSONAL SERVICE	45	46.7	33.3	17.8	2.2	0.0	0.0	0.0	0.0	0.0
Laundries	8	12.5	25.0	50.0	12.5	--	--	--	--	--
Cleaning & Pressing Plants	37	54.0	35.1	10.8	--	--	--	--	--	--

* From U. S. Census of Manufacturers, 1929

** From records of State Mine Inspector, 1933

TABLE 4

PERCENTAGE DISTRIBUTION OF WORKERS ACCORDING TO SIZE OF PLANTS SURVEYED

INDUSTRY OR SERVICE	Percent of Workers According to Size of Plants									
	Number of Workers	Less than 5	5 to 20	21 to 50	51 to 100	101 to 250	251 to 500	501 to 1000	1001 to 2500	2501 or more
U.S. Census for Iowa, Manufacturing*	81,678	5.8	10.7	11.7	13.8	16.4	10.3	15.6	11.6	4.0
U.S. Census for Iowa, Coal Mining**	8,300	6.0	20.4	17.4	19.5	23.4	13.4	0.0	0.0	0.0
U.S. Census for Iowa, Both	89,978	5.8	11.5	12.2	14.4	17.1	10.5	14.2	10.6	3.6
ALL INDUSTRIES STUDIED	28,170	1.2	5.3	8.9	10.8	20.8	12.3	13.0	16.1	11.6
EXTRACTION OF MINERALS	596	0.0	2.7	19.3	15.8	62.2	0.0	0.0	0.0	0.0
Bituminous Coal	463	--	3.5	16.4	--	80.1	--	--	--	--
Gypsum	133	--	--	29.3	70.7	--	--	--	--	--
MANUFACTURING & MECHANICAL	27,011	1.1	4.8	7.9	10.6	20.3	12.8	13.6	16.8	12.1
Chemical & Allied	844	3.5	13.4	18.6	26.6	38.0	--	--	--	--
Cigar & Tobacco	2	100.0	--	--	--	--	--	--	--	--
Clay, Glass & Stone	1,771	2.4	4.1	8.5	16.3	26.8	41.8	--	--	--
Clothing	765	2.1	2.1	9.2	28.6	23.6	34.5	--	--	--
Food & Allied	5,900	0.4	4.9	5.3	2.4	4.3	9.7	24.8	48.2	--
Iron & Steel	10,912	0.8	2.3	5.1	9.2	24.1	6.4	6.6	15.4	30.1
Metals Other Than Iron & Steel	169	4.1	10.7	29.0	56.2	--	--	--	--	--
Leather	609	0.2	7.1	16.9	21.8	54.0	--	--	--	--
Lumber & Furniture	2,228	0.9	3.8	12.0	7.0	22.4	22.4	31.4	--	--
Paper, Printing & Allied	696	1.4	26.7	43.8	8.6	19.5	--	--	--	--
Textile	109	11.0	29.4	--	59.6	--	--	--	--	--
Miscellaneous Manufacturing	3,006	1.5	6.4	5.4	15.4	32.3	13.1	26.2	--	--
DOMESTIC & PERSONAL SERVICE	563	10.8	30.2	43.5	15.5	0.0	0.0	0.0	0.0	0.0
Laundries	232	1.3	10.8	50.4	37.5	--	--	--	--	--
Dry Cleaning & Pressing Plants	331	17.5	43.8	38.6	--	--	--	--	--	--

* From U. S. Census of Manufacturers, 1929

** From records of State Mine Inspector, 1938

The percentages of total workers surveyed according to the various sizes of plants are also shown in this table. For example, under the iron and steel classification, 0.8% of the 10,912 persons surveyed in this class were engaged in plants with less than five employees; 2.3% in plants having from five to 20 employees; 5.1% in plants having from 21 to 50 employees, etc. It will be noted that 30.1% of the workers covered in this group were in plants having more than 2,500 employees. This is accounted for by the fact that one plant of this size was selected by chance from this group. If additional plants in this group had been surveyed this figure would by necessity be reduced.

These two tables (3 and 4) disclose some notable facts in regard to future work. First, it is indicated that the majority of plants in the State employ less than five workers and by far the largest number of plants employ less than 20 workers both in the manufacturing and coal mining industries. Hence, on the basis of plants to be contacted, most of the future work should be done in the smaller establishments.

On the other hand, Table 4 indicates that the majority of workers are employed in plants having more than five workers, and on the basis of number of persons (which is the most logical basis) to be contacted or affected by the future work of this division, efforts should be concentrated on the larger size plants.

Figure 4 shows in graphical form the distribution of workers according to the size of plants both as to the total workers in

the manufacturing industry according to U. S. Census figures and the workers included in the survey. This graph indicates that the sample (plants selected for survey) is quite representative of the entire group although possibly more of the smaller plants should have been selected.

DISTRIBUTION OF WORKERS BY SIZE OF PLANT
ACCORDING TO 1930 CENSUS OF MANUFACTURING INDUSTRY
AND IOWA SURVEY OF MANUFACTURING AND MECHANICAL INDUSTRY

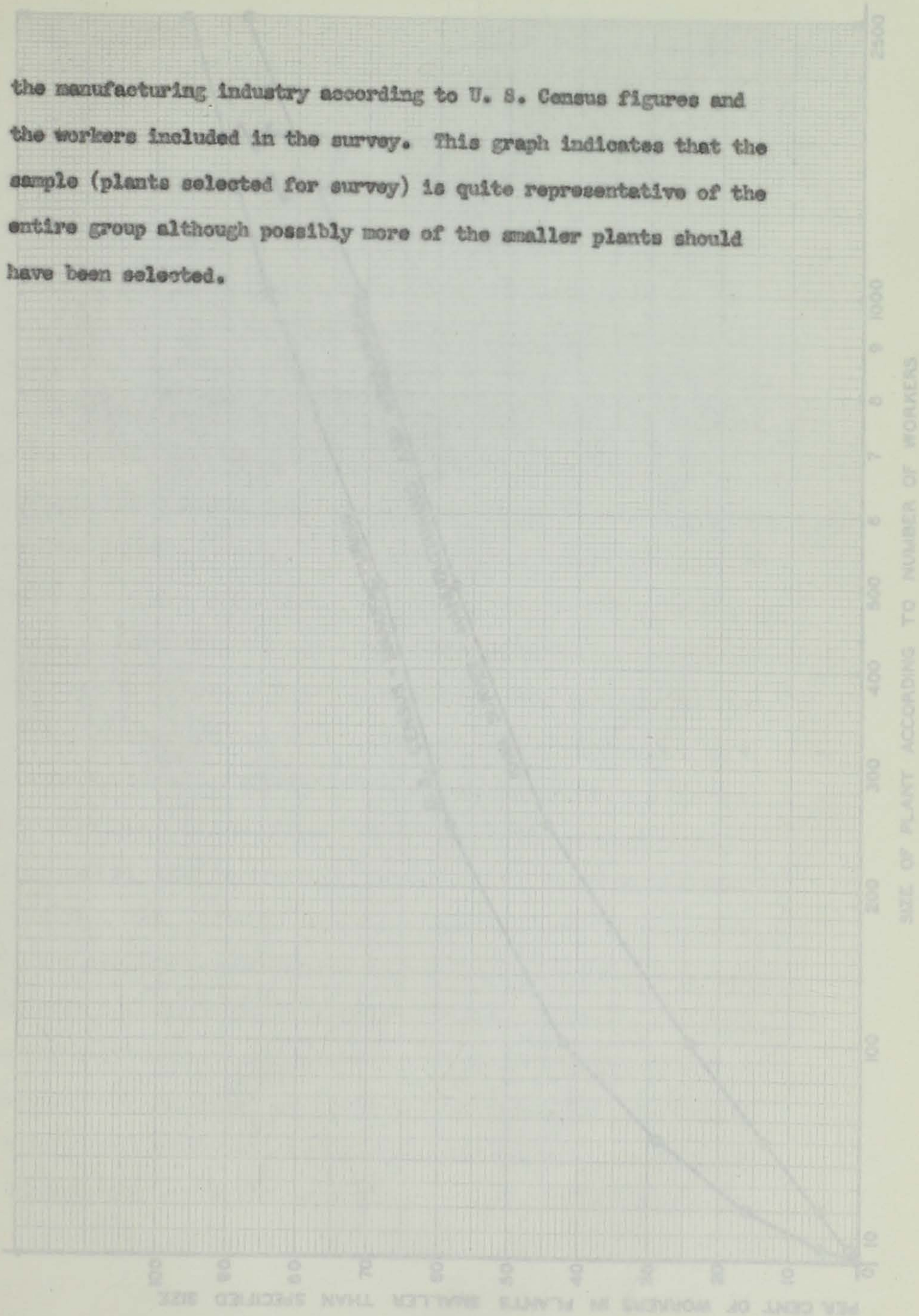
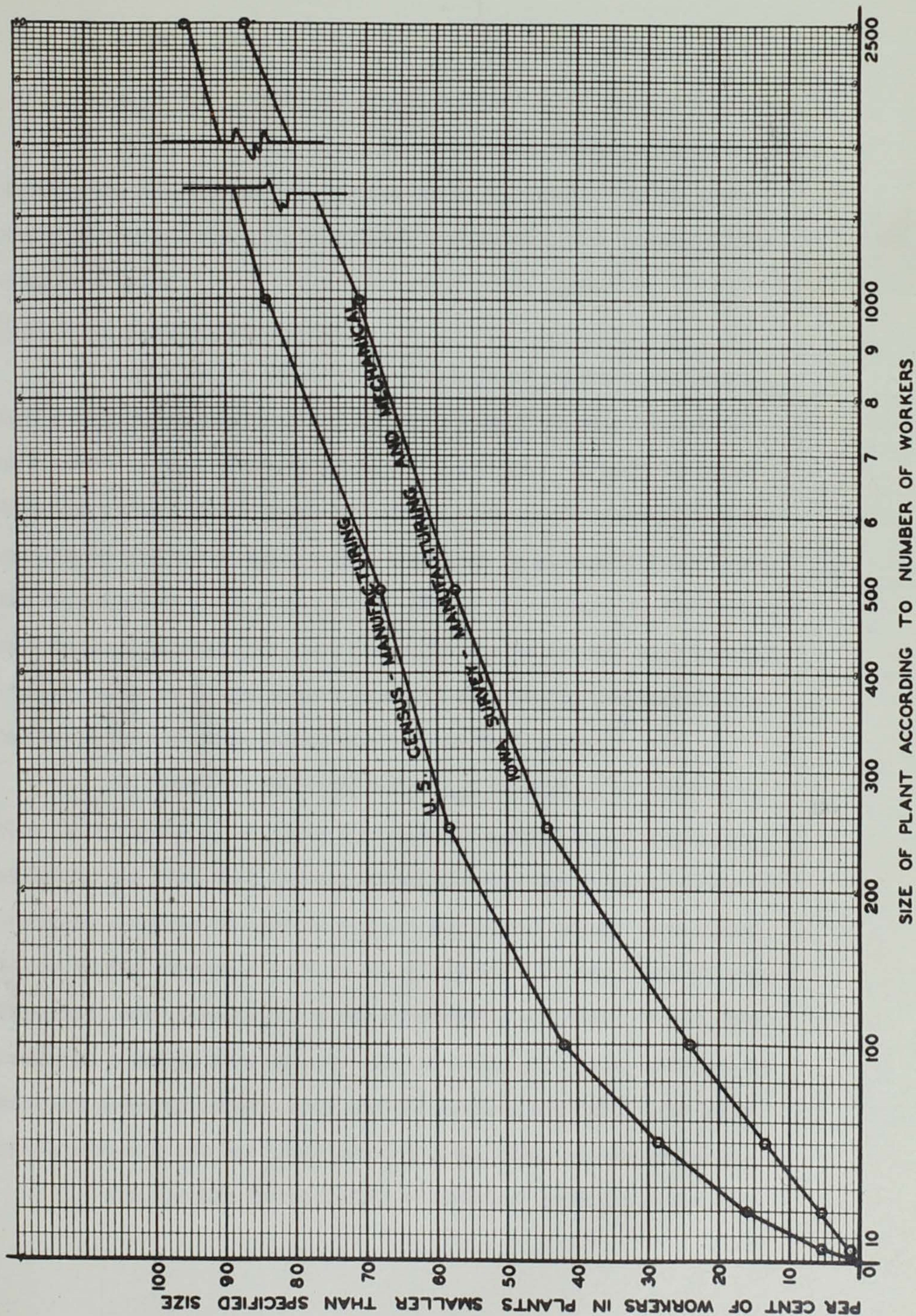


FIG. 4

DISTRIBUTION OF WORKERS BY SIZE OF PLANT
 ACCORDING TO 1930 CENSUS OF MANUFACTURING INDUSTRY
 AND IOWA SURVEY OF MANUFACTURING AND MECHANICAL INDUSTRY



FINDINGS OF THE SURVEY

On the following pages is presented a series of tables showing the findings of the survey, as to industrial welfare provisions, exposure to various hazardous materials, and control measures in effect.

Industrial Welfare Provisions.

Table 5 is a tabulation of industrial welfare provisions and shows the various types of safety services and the percentage of workers to whom these services are available. It will be noted that the percentage of workers in the Mining and Manufacturing group covered by workmen's compensation insurance is extremely high, ranging from 92.3 to 100%, whereas only 27% of the workers in the Domestic and Personal Service group are covered. The relatively high probability of accidents in the former group is undoubtedly responsible for the large number of insurance carriers in that group.

In regard to the relatively high percentage of workers to whom the services of a safety director are available, attention is called to the fact that in many establishments the responsibility of providing adequate safeguards against accidental injury is assigned to one of the employees such as the personnel director, general superintendent, shop foreman, or other supervising official. Hence, his duties as a safety director are carried along part time, although he does not properly compare with one who devotes his full time as a safety director but has more than one plant under his supervision.

The caption "other safety activities" includes membership

TABLE 5

INDUSTRIAL WELFARE PROVISIONS

SAFETY ORGANIZATION

INDUSTRY OR SERVICE GROUP	Number of Plants Surveyed	Number of Workers Surveyed	Percentage of Workers to Whom Service is Available				
			Safety Director Part Time	Safety Director Full Time	Shop Com- mit- tees	In- sur- ance *	Other Safety Activi- ties
ALL INDUSTRIES	414	28,170	49.7	11.8	39.3	99.0	53.0
EXTRACTION OF MINERALS	10	596	67.0	0.0	43.3	95.2	41.8
Bituminous Coal	8	463	57.4	--	33.5	93.9	33.5
Gypsum	2	133	100.0	--	100.0	100.0	70.7
MANUFACTURING & MECHANICAL	339	27,011	49.6	12.3	39.9	99.0	53.7
Chemical & Allied	23	844	52.7	--	17.4	98.5	36.9
Cigar & Tobacco	1	2	--	--	--	--	--
Clay, Glass & Stone	32	1,771	55.4	--	63.8	98.9	64.0
Clothing	14	763	10.1	--	--	99.2	58.1
Food & Allied	46	5,900	67.0	--	82.5	99.8	68.9
Iron & Steel	101	10,912	37.2	30.4	34.2	98.6	53.8
Metals Other Than Iron & Steel	7	169	10.6	--	56.2	92.3	--
Leather	11	609	72.8	--	--	100.0	37.6
Lumber & Furniture	29	2,228	40.8	--	13.7	99.7	18.2
Paper, Printing & Allied	30	696	49.0	--	6.0	100.0	31.6
Textile	10	109	17.4	--	--	94.5	--
Miscellaneous Manufacturing	50	3,008	71.6	--	15.5	99.0	61.7
DOMESTIC & PERSONAL SERVICE	45	563	33.6	0.0	0.0	27.0	26.3
Laundries & Cleaning Plants	45	563	33.6	--	--	27.0	26.3

Dash (--) denotes no workers with indicated service.

* Includes only Workmen's Compensation Insurance.

in a safety organization such as the National Safety Council, the posting of safety placards, or insurance coverage other than workmen's compensation such as group life or group health and accident.

Inspections made by representatives of the State Department of Labor, the State Mine Inspector, or insurance companies have not been recorded under any of the captions. A shop committee denotes a group appointed by the management or elected by the workmen to devote particular attention to safety measures and to make recommendations to the management for the installation or repair of safety devices.

Table 6 shows the number of workers to whom certain medical provisions are available in event of sickness or injury. Facilities for hospitalization were recorded only when the patient could remain overnight under a physician's or nurse's care. Where a bed or cot was provided in a separate room but other equipment or medical care was lacking or it was not the intention of the management that the patient remain overnight, the room was regarded as a first-aid room. These rooms were also equipped with provisions for medical aid which in many cases supplanted first-aid kits within the plant. Hence, where such rooms were available credit was not given for a first-aid kit and the percentage of workers having first-aid kits available appears to be low in some classes of industry. This is notable in the iron and steel group where only 30% of the workers have a first-aid kit available. However, in the same group, 54.4% of the workers have a first-aid room available. Hence, a total of

TABLE 6

INDUSTRIAL WELFARE PROVISIONS - MEDICAL PROVISIONS

Percentage of Workers to Whom Service is Available

INDUSTRY OR SERVICE GROUP	Number of Plants Surveyed	Number of Workers Surveyed	Hospital	First-Aid		First-Trained Aid Worker	Physician		Nurse	
				Room	Kit		Part Time	Full Time	Part Time	Full Time
ALL INDUSTRIES	414	28,170	8.5	48.5	46.6	44.2	92.2	6.0	4.2	39.6
EXTRACTION OF MINERALS	10	596	--	--	100.0	68.4	100.0	--	--	--
Bituminous Coal	8	463	--	--	100.0	59.4	100.0	--	--	--
Gypsum	2	133	--	--	100.0	100.0	100.0	--	--	--
MANUFACTURING & MECHANICAL	359	27,011	8.8	50.5	44.7	43.9	88.6	6.2	4.3	41.2
Chemical & Allied	23	844	--	25.7	74.4	75.0	98.0	--	--	--
Cigar & Tobacco	1	2	--	--	--	--	--	--	--	--
Clay, Glass & Stone	32	1,771	--	22.4	77.0	73.2	98.5	--	--	--
Clothing	14	765	--	23.6	70.4	23.6	74.7	--	--	--
Food & Allied	46	5,900	--	84.6	15.0	60.6	99.0	--	23.6	--
Iron & Steel	101	10,912	15.4	54.4	30.5	29.8	78.5	15.4	8.4	73.0
Metals Other Than Iron & Steel	7	169	--	--	100.0	56.2	95.9	--	--	52.3
Leather	11	609	--	--	100.0	6.4	99.9	--	--	--
Lumber & Furniture	29	2,228	31.4	22.4	45.7	27.1	86.0	--	13.1	31.4
Paper, Printing & Allied	30	696	--	19.5	80.5	32.4	87.2	--	8.6	--
Textile	10	109	--	--	39.4	--	94.5	--	--	--
Miscellaneous Manufacturing	50	3,006	--	43.7	97.5	64.4	98.0	--	--	13.1
DOMESTIC & PERSONAL	45	563	--	--	98.2	31.1	82.6	--	--	--
Laundries & Dry Cleaning Plants	45	563	--	--	98.2	31.1	82.6	--	--	--

Dash (---) denotes no workers with indicated service.

approximately 85% of the workers have one or the other facility available which compares favorably with the other groups.

In regard to first-aid kits, it should be explained that credit was given for this facility even though the equipment was incomplete. In many cases only a bottle of antiseptic solution and a roll of bandage material was supplied. However, it was explained by some of the industrial officials that a more complete kit was undesirable because it led to injuries treated by first-aid which should have more adequate treatment by a physician and nurse. In some cases the management was advised by physicians to bring all cases of injury under competent medical care immediately without administering first aid.

Under the category of physician part time were included those physicians recommended by the company writing compensation insurance for the treatment of injuries. In some cases a list of physicians recommended by the company was posted in the plant. In others, a list was supplied to the management. Perhaps these physicians were not properly classed as part time since they usually do not visit the plant except for emergency treatment of injury and thus do not have supervision over the medical program. However, it was felt that the services of a specific physician or group of physicians designated in this manner was something of an advantage over those cases where no medical service at all was provided. Hence, such services were included under this caption. If these were not included, the percentage of workers to whom this service was available

would be very low, probably less than 10% in all groups except Food and Allied in which one plant employing 1,200 persons provides the services of a physician who spends part of his time at the plant.

Part time nursing service included only those where the plant was visited every day or where a nurse was employed full time in some other capacity but was available for nursing care in case of emergency. Several plants covered by the survey were visited periodically (once or twice a year) by nurses representing insurance companies. This service was not included, although the value of such visits are recognized from the standpoint of an educational program. A few of the plants visited were subsidiaries of other large plants wherein a full time nurse was employed. Since the full time nurse was available by mutual agreement to the subsidiary company employees, the service was recorded as full time.

The data collected in regard to records kept of sicknesses and accidents are presented in Table 7. It will be noted that a large percentage of the workers surveyed were covered by accident records but only about one-half the workers were covered by sickness records, and most of these merely recorded absenteeism because of sickness without further details as to nature of the illness and other pertinent information. The fact that reports of accidents arising out of employment are required by the insurance companies, State Industrial Commissioner, and State Labor Commissioner undoubtedly accounts for the large number of these records being kept. Sickness records, however, are not required by any State agency, hence a smaller number of

TABLE 7

INDUSTRIAL WELFARE PROVISIONS - DISABILITY STATISTICS

INDUSTRY OR SERVICE GROUP	Number of Plants Surveyed	Number of Workers Surveyed	Percentage of Workers to Whom Facility is Available		
			Sick Benefit Associ- ation	Sickness Records	Accident Records
ALL INDUSTRIES	414	28,170	48.0	52.6	91.5
EXTRACTION OF MINERALS	10	596	0.0	15.8	95.1
Bituminous Coal	8	463	--	--	93.9
Gypsum	2	133	--	70.7	100.0
MANUFACTURING & MECHANICAL	359	27,011	50.0	54.3	91.7
Chemical & Allied	28	844	44.6	67.8	85.7
Cigar & Tobacco	1	2	--	--	--
Clay, Glass & Stone	32	1,771	48.2	50.4	95.7
Clothing	14	765	--	23.6	58.4
Food & Allied	46	5,900	70.2	70.3	97.4
Iron & Steel	101	10,912	66.7	72.0	96.6
Metals Other Than Iron & Steel	7	169	--	--	95.9
Leather	11	609	4.8	4.8	79.7
Lumber & Furniture	29	2,228	2.3	1.9	68.9
Paper, Printing & Allied	30	696	25.6	19.5	73.7
Textile	10	109	59.6	--	91.7
Miscellaneous Manufacturing	50	3,006	17.7	27.0	93.8
DOMESTIC & PERSONAL SERVICE	45	563	--	8.0	78.8
Laundries & Dry Cleaning Plants	45	563	--	8.0	78.8

Dash (—) denotes no workers with indicated service

these records is to be expected. Inquiry was made as to the existence of sick benefit associations within the plant because these organizations are, in a great number of cases, a good source of data in regard to sicknesses. It will be noted that approximately one-half the workers surveyed in the Manufacturing and Mechanical group were associated with such organizations.

A comparison of industrial welfare provisions in plants with less than and plants with more than 100 workers is given in Table 8. It is evident from this tabulation that the smaller size plants were far below the large plants in practically all the listed services but that even the latter group were lacking in some of the facilities. It should again be pointed out that the apparent deficiency in first-aid kits among the larger size plants is due to the fact that no credit was given for having kits available when first-aid rooms were maintained.

Figure 5 is a graphical representation of the same data bringing out more clearly the deficiencies in services available.

A comparison of available industrial welfare services for several States including Iowa, where similar surveys have been made, is shown in Table 9. The typical industrial area appearing as the heading of the first column is one so designated in bulletin 216, U. S. Public Health Service and is located in the State of Missouri. It will be noted that for the most part conditions in Iowa are approximately the same as in the other States. Where major discrepancies occur, they are probably due to the interpre-

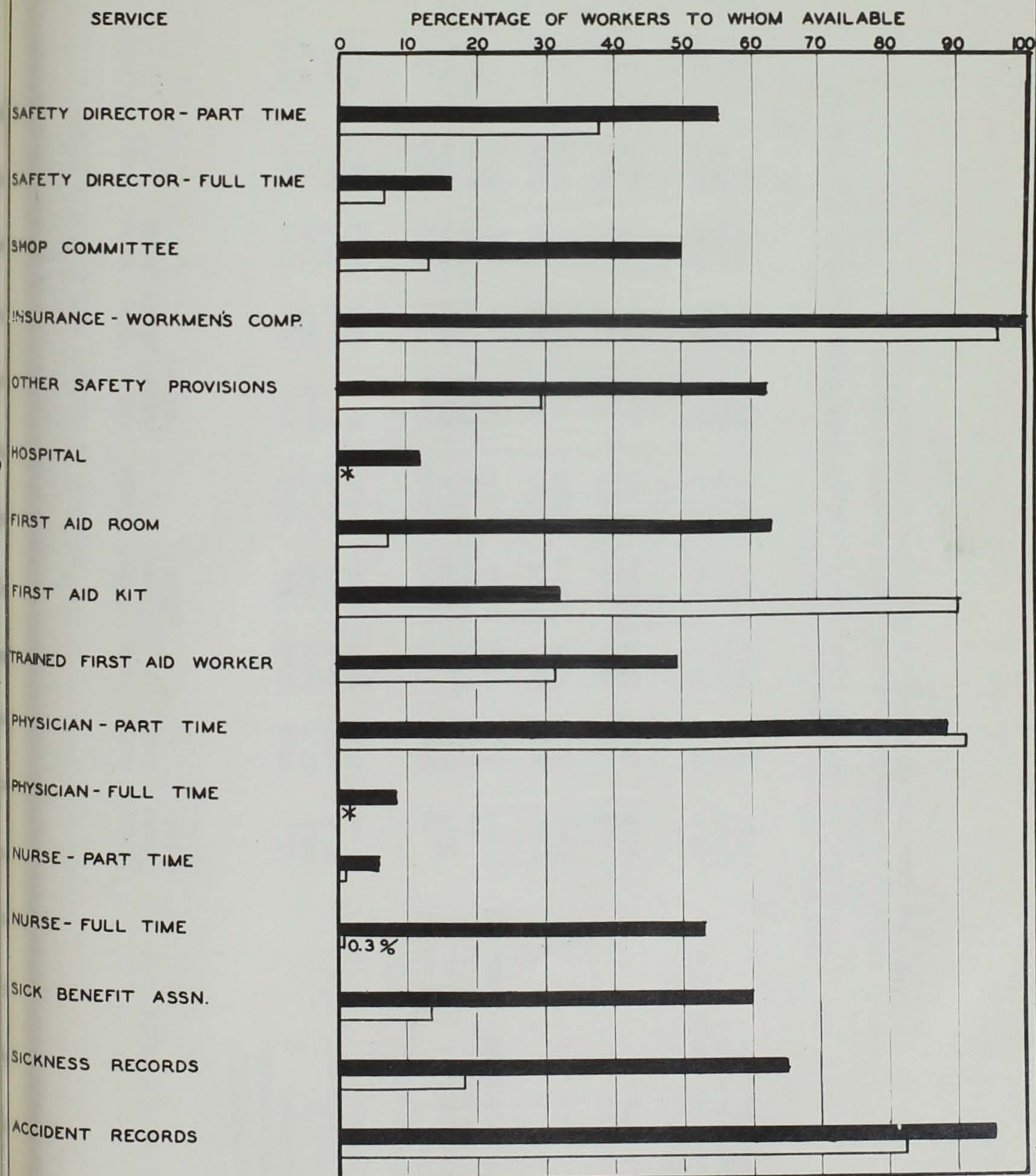
TABLE 8

INDUSTRIAL WELFARE SERVICE IN PLANTS WITH 100 OR MORE WORKERS AS COMPARED
WITH PLANTS HAVING LESS THAN 100 WORKERS

KIND OF SERVICE	Percentage Workers With Listed Service	
	Plants with 100 or more workers	Plants with less than 100 workers
SAFETY PROVISIONS		
Safety Director		
Part Time	54.0	37.6
Full Time	15.7	5.9
Shop Committees	48.7	12.4
Insurance	100.0	93.5
Other Methods	61.5	28.7
MEDICAL PROVISIONS		
Hospital	11.4	0.0
First-Aid Room	63.1	6.8
First-Aid Kit	31.8	90.0
Trained First-Aid Worker	48.7	31.0
Physician		
Part Time	87.9	91.1
Full Time	8.1	0.0
Nurse		
Part Time	5.3	0.8
Full Time	53.1	0.3
STATISTICS		
Sick Benefit Association	60.2	13.3
Sickness Records	64.7	18.0
Accident Records	94.9	81.7
Total number of workers surveyed	20,842	7,323

FIG. 5

WELFARE PROVISIONS IN PLANTS WITH MORE THAN 100 WORKERS AND IN PLANTS WITH LESS THAN 100 WORKERS



* NONE

PLANTS WITH MORE THAN 100 WORKERS — —

PLANTS WITH LESS THAN 100 WORKERS — —

Per Cent of Workers with Listed Facility

KIND OF SERVICE	Typical Industrial Area	Maryland	Utah	South Carolina	Texas	New Hampshire	Virginia	Colorado	Idaho	Illinois	Iowa
SAFETY PROVISIONS											
Safety Director	21.0	20.8	17.4	4.1	22.1	14.0	27.6	21.1	35.5	30.5	49.7*
Part Time	23.8	37.6	38.8	0.0	21.7	12.3	17.8	30.8	6.3	21.7	11.8
Full Time	33.6	59.3	46.3	55.7	54.6	33.2	61.5	40.3	24.7	58.1	39.3
Shop Committees	—	97.8	61.3	94.5	95.5	92.9	98.7	96.2	99.4	90.5	99.0
Insurance	—	—	—	—	—	—	—	—	—	—	—
MEDICAL PROVISIONS											
Hospital	—	25.8	25.5	—	14.8	1.4	—	22.5	10.1	0.4	8.5
First-Aid Room	48.5	55.8	62.2	50.0	30.4	47.3	50.0	56.2	31.0	54.5	48.5
First-Aid Kit	—	97.7	90.6	—	97.4	99.2	—	89.2	96.8	97.7	46.6**
Trained First-Aid Worker	—	65.4	72.6	—	53.5	39.2	—	46.7	58.3	33.7	44.2
Physician	—	—	—	—	—	—	—	—	—	—	—
Part Time	17.3	42.4	19.0	25.6	6.5	4.3	25.6	9.1	70.6	30.2	92.2**
Full Time	15.3	30.7	30.5	21.0	30.4	4.5	21.0	23.8	10.0	9.8	6.0
Nurse	—	—	—	—	—	—	—	—	—	—	—
Part Time	2.7	0.0	4.9	1.9	0.0	1.7	1.9	1.3	14.5	1.5	4.2
Full Time	34.1	40.3	25.2	30.6	28.2	21.2	30.6	29.5	16.8	32.6	39.5
STATISTICS											
Sick Benefit Association	29.4	47.8	64.6	35.1	37.9	23.7	35.1	44.5	36.0	42.4	48.0
Sickness Records	40.0	54.5	65.3	54.1	49.8	29.3	34.1	38.9	38.5	42.2	52.6
Accident Records	98.1	96.9	98.9	98.5	90.0	99.1	98.5	89.9	99.3	97.4	91.5

Dash (—) Indicates Data Not Available

* Includes superintendents or others charged with responsibility of providing safety measures

** Includes physician designated by insurance companies

*** Does not include first-aid equipment in first-aid rooms

tation of services available as explained in conjunction with Tables 5, 6 and 7.

Assuming that the plants surveyed were representative of all plants in the State and using the U. S. Census as a basis, the expected number of persons having the various industrial welfare facilities available to them was calculated and tabulated in Table 10. For example, in the previous discussion it was pointed out that 25.7% of the workers in the Chemical and Allied industry had a first-aid room available. The census for 1930 shows that there were 4,445 workers in this industry throughout the State, hence it is assumed that 25.7% or 1,140 of them have a first-aid room available.

Occupational Exposure to Specified Materials and Conditions.

In the modern industrial plant numerous materials are used which may, under certain conditions, be causative factors in the production of occupational diseases. These materials may be an integral part of a production process such as a solvent used in removing grease or oil, an alkali for cleaning metal parts preparatory to electroplating, or a lacquer or paint used in coating the finished product.

More frequently, however, the materials contributing to the causation of occupational diseases are those which are formed during the process or operation. Since these substances are in many cases by-products of the process or have no value, their presence is often unknown or their toxic properties are overlooked. Examples of this type of material are the dusts from grinding, polishing, sandblasting, rock drilling or similar operations; gases, such as carbon monoxide which is formed

TABLE 10

EXPECTED NUMBER OF PERSONS TO WHOM VARIOUS INDUSTRIAL WELFARE FACILITIES ARE AVAILABLE

Expected Number¹ of Workers to Whom Indicated Service is Available

		Extraction of Minerals				Manufacturing and Mechanical Industries						Domestic and Personal Service				
Industrial Welfare Service	Total in all Industries	Bituminous Coal	Gypsum	Chemical & Allied	Clay, Glass & Stone	Clothing	Food & Allied	Iron & Steel	Other Metals	Leather	Lumber & Furniture	Paper, Printing & Allied	Textile	Miscellaneous	Laundries	Dry Cleaning Plants
TOTAL WORKERS 1930 CENSUS	133168	7759	168	4445	5324	4276	26106	32047	1435	1351	7239	8745	1780	26762	3739	1406
SAFETY PROVISIONS																
Safety Director, Part Time	69700	4430	168	2340	2950	450	17500	12000	153	985	2950	4260	312	19200	1740	343
Safety Director, Full Time	9780	---	---	---	---	---	---	9780	---	---	---	---	---	---	---	---
Shop Committees	45800	2580	168	774	3390	---	21400	11000	805	---	994	525	---	4150	---	---
Insurance	130000	7240	168	4570	5270	4240	26000	31600	1320	1350	7210	8740	1690	25500	3690	1200
Other Methods	67800	2580	119	1640	3420	2490	18000	17300	---	509	1320	2750	---	16500	758	428
MEDICAL PROVISIONS																
Hospital	7230	---	---	---	---	---	---	4960	---	---	2270	---	---	---	---	---
First-Aid Room	57900	---	---	1140	1200	1000	22100	17400	---	---	1620	1700	---	11700	---	---
First-Aid Kit ²	77100	7760	168	3300	4100	3000	3920	9800	1410	1350	3300	7000	706	26200	3740	1360
Trained First-Aid Worker	63300	4580	168	3340	3900	1000	15800	9580	805	87	1960	2820	---	17200	1740	284
Physician, Part Time ³	121000	7760	168	4350	5240	3190	25900	25200	1370	1350	6220	7590	1690	26300	3280	1110
Physician, Full Time	4960	---	---	---	---	---	---	4960	---	---	---	---	---	---	---	---
Nurse, Part Time	4460	---	---	---	---	1000	---	2710	---	---	---	750	---	---	---	---
Nurse, Full Time	41700	---	---	---	---	---	19100	16800	---	---	2270	---	---	3520	---	---
DISABILITY STATISTICS																
Sick Benefit Association	52500	---	---	1980	2360	---	18300	21400	---	65	166	2220	1060	4740	---	---
Sickness Records ⁴	57600	---	119	3010	2690	1000	18300	23200	---	65	137	1700	---	7210	---	191
Accident Records	119000	7240	168	3810	5090	2500	25400	31000	1370	1220	4980	6410	167	25100	3210	1040

Dash (--) indicates no workers to whom service is available.

1. Expected numbers are expressed to three significant figures only.

2. Does not include first-aid kit kept in first-aid room.

3. Includes physician designated by insurance company carrying workman's compensation coverage.

4. Includes absenteeism records.

in the combustion of carbonaceous material or nitrous oxides arising from the welding operation; vapors, such as organic solvents used in the dry cleaning trade and quick driers used in lacquers, paints, and varnishes; fumes, such as zinc, brass or lead, arising from these metals when heated; and mists, such as chromic acid arising from electroplating vats.

The kind of material used in the various industrial processes is variable, and is dependent upon the finished product, nature of the process, the equipment at hand, and to some extent upon the judgment of the plant official as to the most economical or efficient procedure. One of the important objectives of this survey was to learn the extent to which the industrial workers in the State are exposed to the various materials. Since a complete list of all materials used would probably contain some 500 or more separate items, it was deemed advisable to group them as much as possible. The classification therefore contains 46 main groups as shown by the schedule appearing in Appendix III. This schedule is similar to the one appearing in Bulletin 238, "Evaluation of the Industrial Hygiene Problems of a State", by Bloomfield and Peyton, U. S. Public Health Service. For example, sand and granite are classified under "Dust, Silica"; shale, slate, cement, are under "Dust, Silicate"; marble, gypsum, under "Dust Non-siliceous"; carbon tetrachloride, under "Halogenated Hydrocarbons"; benzol (benzene), toluol, gasoline, stoddard's solvent, under "Organic Solvents"; and tar, cutting oils, chocolate, under "Dermatitis Producers".

No attempt has been made to classify the degree of exposure because such a classification must be based on detailed studies of the process including the collection of air samples to determine the concentration of harmful ingredient and a determination of the duration of exposure. Hence, the data on exposures herein presented merely express the potentialities of the situation which can be used as a basis for more detailed studies to be conducted in the future.

The following pages will be devoted to a discussion of the material exposures in the various groups surveyed and the control measures in effect. The situation for the groups as a whole will be considered first and the details for each individual industry will be discussed on subsequent pages.

Table 11 shows the number of workers exposed to various materials in the groups of industries surveyed. The percentage exposed of the total number of workers surveyed in the group is also given. For example, in the iron and steel group, 2,141 workers are exposed to carbon monoxide. This number represents 19.6% of the total of 10,912 workers surveyed in this group.

It should here be explained that all drivers of gasoline driven trucks or conveyances were given exposure to carbon monoxide as being present in the exhaust gas.

As will be noted, the materials are arranged in order of the number of persons exposed in all industries surveyed. Heading the list are the 9,772 workers exposed to "other metals" which

TABLE 11

NUMBER AND PERCENT OF WORKERS EXPOSED TO SPECIFIED MATERIALS IN EACH INDUSTRY AND SERVICE GROUP

	All Industries Surveyed		Extraction of Minerals		Chemical & Allied		Cigar & Tobacco		Clay, Glass & Stone		Clothing		Food & Allied		Iron & Steel		Other Metals		Leather		Lumber & Furniture		Paper & Printing		Textiles		Misc. Mfg.		Domestic & Personal Service		
NUMBER OF WORKERS IN SURVEYED PLANTS																															
	28170		596		844		2		1771		765		5900		10912		169		609		2223		696		109		3006		563		
NUMBER AND PERCENT OF EACH GROUP EXPOSED																															
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Base Metals	9772	34.8	18	3.2	104	12.3			85	4.8	1	0.1	409	6.9	7961	72.9	151	89.4	18	3.0	181	8.1	31	11.6	2	1.8	761	25.4			
Acid, Organic	6253	22.3	12	2.0	96	11.4	2	100.0	14	0.8	648	84.8	1238	20.9	783	7.2	24	14.2	255	41.9	2225	99.8	230	33.0	84	77.0	894	29.8	110	19.0	
Arthritis Producers, NOC	3282	11.7	6	1.0	21	2.5			45	2.5			447	7.6	2329	21.3	45	26.6	5	0.8	138	6.2	108	15.5	14	12.8	123	4.1	1	0.0	
Other Gases	3201	11.4	470	79.0	152	18.0			87	4.9			154	2.6	2000	18.3	37	21.9			23	1.3	24	3.4	3	2.8	224	7.5	22	3.0	
Carbon Monoxide	2949	10.5	63	10.6	66	7.8			144	8.1			206	3.5	2142	19.6	55	32.5	4	0.7	26	1.2	49	7.0	3	2.8	132	4.4	59	10.0	
Petroleum Products	2915	10.4			31	3.7			85	4.8			100	1.7	2356	21.5	40	23.7	3	0.5	114	5.1	45	6.5			140	4.7	1	0.0	
Acid, Siliceous	2653	9.4	40	6.7	5	0.6			329	18.5			8	0.1	2090	19.1	76	45.0	15	2.5	70	3.1	2	0.3			18	0.6			
Excess Heat	2321	8.2			49	5.8			17	9.6			186	3.2	1806	16.5	42	24.8					22	3.2			64	2.1	135	24.0	
Acid, Silicate	2040	7.3	215	36.1	32	3.8			1011	57.1	2	0.3	72	1.2	440	4.0			4	0.7	38	1.7	12	1.7	14	12.8	195	6.5	5	0.0	
Acid, Non-siliceous	2007	7.1	127	21.3	33	3.9			232	13.1			19	0.3	896	8.2	33	19.5			13	0.6	2	0.3			652	21.7			
Acid, Coal, Bituminous	1150	4.1	434	72.9	83	9.8			170	9.6			47	0.8	318	2.9	7	4.1			12	0.5	7	1.0	3	2.8	64	2.1			
Oils, Fats & Waxes	986	3.5			74	8.8							290	4.9	416	3.8	19	11.2	18	3.0	90	4.0	19	2.7	8	7.3	44	1.5	8	1.0	
Organic Solvents, NOC	950	3.4			19	2.3			8	0.5	4	0.5	26	0.4	383	3.5	6	3.5	33	5.4	125	5.6	24	3.4	10	9.2	240	8.0	72	12.0	
Alkaline Compounds	710	2.5			237	28.1			11	0.6			97	1.6	172	1.1	17	10.1	13	2.1			49	7.0	5	4.6	38	1.3	71	12.0	
Excess Humidity	660	2.3	416	69.8							3	0.4	166	2.8									33	4.7					42	7.0	
Sulfur Dioxide	491	1.7	5	0.8	44	5.2			59	3.3			107	1.8	163	1.5					11	0.5	6	0.9	3	2.8	88	2.9	5	0.0	
Lead & Compounds	390	1.4			23	2.7			4	0.2			7	0.1	92	0.8	10	5.9			26	1.2	204	29.3			24	0.8			
Sulfur & Compounds	350	1.2	212	37.4	46	5.5							13	0.2			4	2.4	13	2.1			27	3.9			35	1.2			
Chemicals, Inorganic, NOC	345	1.2			68	8.1			31	1.8			63	1.1	66	0.6	22	13.0	14	2.3			24	3.4			51	1.7	6	1.0	
Infectious Materials	343	1.2			30	3.6							281	4.8	1	--			31	5.1											
Alloys	329	1.2			16	1.9					7	0.9	17	0.3	7	0.1			12	2.0					136	19.5			134	4.5	
Paint & Enamel	324	1.2			14	1.7			2	--			10	0.2	221	2.0	5	1.8	11	1.8	23	1.0	1	0.1	2	1.8	37	1.2			
Acids, Mineral	323	1.2			2	0.2			2	--			49	0.8	100	0.9	14	8.3	13	2.1			15	2.2	3	2.8	76	2.5	49	8.0	
Chemicals, Organic, NOC	319	1.1			38	4.5			1	--	1	0.1	27	0.5	22	0.2	9	5.3	13	2.1			4	0.6			157	5.2	47	8.0	
Resin & Varnish	237	0.8			3	0.4			4	0.2			5	0.1	128	1.1	1	0.6	6	1.0			2	0.3			33	1.8			
Alcohols, Esters & Ethers	200	0.7			19	2.3			1	--			2	--	68	0.6	4	2.4			23	1.0	21	3.0	5	4.6	10	0.3	47	8.0	
Resins	145	0.5			9	1.1					5	0.6	2	--	9	--			20	3.3	59	2.6	2	0.3	2	1.8	31	1.0	4	0.0	
Acids, Organic	139	0.5			2	0.2			2	--			16	0.3	46	0.4							4	0.6			22	0.7	47	8.0	
Halogenated Hydrocarbons	124	0.4			2	0.2							1	--	22	0.2					29	1.3					22	0.7	48	8.0	
Coal Tar Products	111	0.4			42	5.0									17	0.2			3	0.5	14	0.6			15	13.8	20	0.7			
Nitrogen Sulfide	102	0.4			20	2.4			12	0.7													70	10.0					5	0.2	
Analytical Chemicals	97	0.3			16	1.9			26	1.5			36	0.6	14	0.1												2	--		
Amides	65	0.2													49	0.4	11	6.5					3	0.4					22	0.7	
Antimony & Compounds	52	0.2													11	0.1	2	1.2					17	2.4							
Alcals	42	0.1			38	4.5									4	--															
Chromium & Compounds	34	0.1													11	0.1	4	2.4	13	2.1			1	0.1					5	0.2	
Acid, Asbestos	33	0.1			3	0.4									30	0.3															
Acid, Coal, Anthracite	30	0.1			30	3.6																							25	0.8	
Accelerators	25	--																											7	--	
Aldehydes	9	--													2	--															
Aluminum & Compounds	7	--													6	0.1							1	0.1							
Iodine & Compounds	4	--			2	0.2							2	--																	
Alkyl & Compounds	2	--																													
Mercury & Compounds	2	--													1	--													1	--	

NOC - Not otherwise classified.

Dash (--) indicates less than 0.1%.

Blank space indicates none exposed.

TABLE 11

NUMBER AND PERCENT OF WORKERS EXPOSED TO SPECIFIED MATERIALS IN EACH INDUSTRY AND SERVICE GROUP

All Industries Surveyed	Extraction of Minerals	Chemical & Allied	Cigar & Tobacco	Clay, Glass & Stone	Clothing	Food & Allied	Iron & Steel	Other Metals	Leather	Lumber & Furniture	Paper & Printing	Textiles	Misc. Mfg.	Domestic & Personal Service	
NUMBER OF WORKERS IN SURVEYED PLANTS															
28170	596	844	2	1771	765	5900	10912	169	609	2228	696	109	3006	563	
NUMBER AND PERCENT OF EACH GROUP EXPOSED															
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
9772	34.8	18	3.2	104	12.3			85	4.8	1	0.1	409	6.9	7961	72.9
6253	22.3	12	2.0	96	11.4	2	100.0	14	0.8	648	84.8	1238	20.9	783	7.2
3282	11.7	6	1.0	21	2.5			45	2.5			447	7.6	2329	21.3
3201	11.4	470	79.0	152	18.0			87	4.9			154	2.6	2000	18.3
2949	10.5	63	10.6	66	7.8			144	8.1			206	3.5	2142	19.6
2915	10.4			31	3.7			85	4.8			100	1.7	2356	21.5
2653	9.4	40	6.7	5	0.6			329	18.5			8	0.1	2090	19.1
2321	8.2			49	5.8			17	9.6			186	3.2	1806	16.5
2040	7.3	215	36.1	32	3.8			1011	57.1	2	0.3	72	1.2	440	4.0
2007	7.1	127	21.3	33	3.9			232	13.1			19	0.3	896	8.2
1150	4.1	434	72.9	83	9.8			170	9.6			47	0.8	318	2.9
986	3.5			74	8.8							290	4.9	416	3.8
950	3.4			19	2.3			8	0.5	4	0.5	26	0.4	383	3.5
710	2.5			237	28.1			11	0.6			97	1.6	172	1.1
660	2.3	416	69.8							3	0.4	166	2.8		
491	1.7	5	0.8	44	5.2			59	3.3			107	1.8	163	1.5
390	1.4			23	2.7			4	0.2			7	0.1	92	0.8
350	1.2	212	37.4	46	5.5							13	0.2		
345	1.2			68	8.1			31	1.8			63	1.1	66	0.6
343	1.2			30	3.6							281	4.8	1	—
329	1.2			16	1.9					7	0.9	17	0.3	7	0.1
324	1.2			14	1.7			2	—			10	0.2	221	2.0
323	1.2			2	0.2			2	—			49	0.8	100	0.9
319	1.1			38	4.5			1	—			27	0.5	22	0.2
237	0.8			3	0.4			4	0.2	1	0.1	5	0.1	128	1.1
200	0.7			19	2.3			1	—			2	—	68	0.6
143	0.5			9	1.1					5	0.6	2	—	9	—
139	0.5			2	0.2			2	—			16	0.3	46	0.4
124	0.4			2	0.2			1	—					22	0.2
111	0.4			42	5.0									17	0.2
102	0.4			20	2.4			12	0.7						
97	0.3			16	1.9			26	1.5					36	0.6
65	0.2													14	0.1
52	0.2													49	0.4
42	0.1													11	0.1
34	0.1			38	4.5									4	—
33	0.1													11	0.1
30	0.1			30	3.6									30	0.3
25	—														
9	—														
7	—													2	—
4	—													6	0.1
2	—			2	0.2									2	—
2	—														
2	—														

Not otherwise classified.

Dash (—) indicates less than 0.1%.

Blank space indicates none exposed.

classification includes iron, steel, copper, zinc, brass, and others not separately classified. As would be expected, the largest number of exposures to this class of material was in the iron and steel group and the largest percentage of exposures occurred in the metals other than iron and steel group. Second on the list is the exposure to organic dusts, numbering 6,253 persons, the largest number of which was in the lumber and furniture group.

Table 11a also shows the number and percentage of exposures to the specified materials. The percentage figures in this table indicate the proportionate number of the total number of exposures to the particular material in all industries surveyed. For example, in all industries surveyed, 9,772 persons were exposed to "other metals", 7,961 or 81.5% of which were in the iron and steel group, 761 or 7.8% in the miscellaneous manufacturing group, 409 or 4.2% in the food and allied group, etc.

While examining the data given in both Tables 11 and 11a it should be borne in mind that a worker may have been exposed to more than one material. Hence the total of the figures appearing under the heading "number of exposures" will be more than the total number of workers surveyed.

In regard to the exposures to silica dust (the causative agent of silicosis), it should be explained that exposures were given to persons regardless of the amount of free silica in the material to which exposed. For example, in the sandblasting process the material used may be more than 90% free silica; in a granite cutting shop,

TABLE 11a

NUMBER AND PERCENT OF TOTAL EXPOSURES TO SPECIFIED MATERIALS IN INDUSTRIES STUDIED

Materials	Number of Exposures	Extraction of Minerals	Chemical & Allied	Cigar & Tobacco	Clay, Glass & Stone	Clothing	Food Allied	Iron & Steel	Other Metals	Leather	Lumber & Furniture	Paper & Printing	Textile	Misc. Mfg.	Domestic & Personal Service
		No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %
Other Metals	9772	18 0.2	104 1.0		85 0.9	1 --	409 4.2	7951 81.5	151 1.5	18 0.2	181 1.9	81 0.8	2 --	761 7.8	
Met, Organic	6253	12 0.2	96 1.5	2 --	14 0.2	648 10.4	1238 19.8	783 12.5	24 0.4	255 4.1	1863 29.9	230 3.7	84 1.3	694 14.3	110 1.7
Granitic Products, NOC	3282	6 0.2	21 0.6		45 1.4		447 15.6	2329 71.0	45 1.4	5 0.2	138 4.2	108 3.3	14 0.4	123 3.7	1 --
Other Cases	3301	470 14.7	152 4.7		87 2.7		154 4.8	2000 62.6	37 1.2		28 0.9	24 0.7	3 --	224 7.0	22 0.7
Carbon Monoxide	2949	63 2.1	66 2.2		144 4.9		206 7.0	2142 72.7	55 1.9	4 0.1	26 0.9	49 1.6	3 0.1	132 4.5	59 2.0
Petroleum Products	2915		31 1.1		83 2.9		100 3.4	2356 80.2	40 1.4	3 0.1	114 3.9	45 1.5		140 4.5	1 --
Met, Siliceous	2653	40 1.5	5 0.2		329 12.4		8 0.3	2090 78.8	76 2.9	15 0.6	70 2.6	2 --		18 0.7	
Gross Heat	2321		49 2.1		17 0.7		186 8.0	1806 78.0	42 1.8			22 0.9		64 2.7	135 5.8
Met, Silicate	2040	215 10.5	32 1.6		1011 49.6	2 --	72 3.5	440 21.6		4 0.2	38 1.9	12 0.6	14 0.7	195 9.6	5 0.2
Met, Non-siliceous	2007	127 6.3	33 1.7		232 11.6		19 0.9	896 44.4	33 1.7		13 0.7	2 0.1		652 32.6	
Met, Coal, Bituminous	1150	434 37.8	83 7.2		170 14.8		47 4.1	318 27.6	7 0.6		12 1.0	7 0.6	3 0.3	64 5.6	5 0.4
Als, Fats, & Waxes	986		74 7.5				290 29.4	416 42.3	19 1.9	18 1.8	90 9.1	19 1.9	8 0.8	44 4.5	8 0.8
Organic Solvents, NOC	950		19 2.0		8 0.8	4 0.4	26 2.7	383 40.4	6 0.6	33 3.5	125 13.2	24 2.5	10 1.0	240 25.3	72 7.6
Alkaline Compounds	710		237 33.5		11 1.5		97 13.7	172 24.2	17 2.4	13 1.8		49 6.9	5 0.7	39 5.3	71 10.0
Gross Humidity	660	416 62.9				3 0.5	166 25.2					33 5.0			42 6.4
Sulfur Dioxide	491	5 1.0	44 9.0		59 12.0		107 21.8	163 34.0			11 2.2	6 1.2	3 0.6	88 17.9	5 1.0
Met & Compounds	390		23 5.9		4 1.0		7 1.8	92 23.7	10 2.6		26 6.7	204 52.2		24 6.1	
Sulfur & Compounds	350	212 60.7	46 13.1				13 3.7		4 1.1	13 3.7		27 7.7		35 10.0	
Minerals, Inorganic, NOC	345		68 19.6		31 9.0		63 18.3	66 19.1	22 6.4	14 4.1		24 7.0		51 14.8	6 1.7
Infectious Materials	343		30 8.7				281 81.9	1 0.3		31 9.1					
Met	329		16 4.9			7 2.1	17 5.2	7 2.1		12 3.7		136 41.3		134 40.7	
Met & Enamel	324		14 4.3		2 0.6		10 3.1	221 68.3	3 0.9	11 3.4	23 7.1	11 0.3	2 0.6	37 11.4	
Als, Mineral	323		2 0.6		2 0.6		49 15.2	100 31.0	14 4.3	13 4.0		15 4.6	3 0.9	76 23.6	49 15.2
Minerals, Organic, NOC	319		33 11.9		1 0.3	1 0.3	27 8.5	22 6.9	9 2.8	13 4.1		4 1.3		157 49.2	47 14.7
Resin & Varnish	237		3 1.3		4 1.7		5 2.1	128 67.6	1 0.4	6 2.5	35 14.8	2 0.7		21 8.9	
Alcohols, Esters & Ethers	200		19 9.5		1 0.5		2 1.0	68 34.0	4 2.0		23 11.5	21 10.5	5 2.5	10 5.0	47 23.5
Met	143		9 6.3			5 3.5	2 1.4	9 6.3		20 14.0	59 41.2	2 1.4	2 1.4	31 21.7	4 2.8
Als, Organic	139		2 1.4		2 1.4		16 11.5	46 33.1				4 2.9		22 15.8	47 33.9
Mononated Hydrocarbons	124		2 1.6				1 --	22 17.7			29 23.4			22 17.7	
Al Tar Products	111		42 38.1					17 15.3		3 2.7	14 12.6		15 13.3	20 18.0	
Nitrogen Sulfide	102		20 19.6		12 11.8							70 68.6			
Analytical Chemicals	97		16 16.5		26 26.8		36 37.1	14 14.4						5 5.2	
Alkyls	65							49 75.4	11 16.9			3 4.6		2 3.1	
Alumina & Compounds	52							11 21.1	2 3.8			17 32.6		22 42.5	
Alkyls	42		33 90.5					4 9.5							
Alumina & Compounds	34							11 32.4	4 11.8	13 38.2		1 2.9		5 14.7	
Met, Asbestos	33		3 9.1					30 90.9							
Met, Coal, Anthracite	30		30 100.0												
Alkaloids	25													25 100.0	
Alkyls	9							2 22.2						7 77.8	
Alumina & Compounds	7							6 85.7				1 14.3			
Alkyls & Compounds	4		2 50.0				2 50.0								
Alkyls & Compounds	2									2 100.0					
Alkyls & Compounds	2							1 50.0						1 50.0	

Dash (—) indicates less than 0.1%.
Blank space indicates none exposed.
NOC - Not otherwise classified.

the dust from the operation may be in the neighborhood of 65% free silica; and the dust in a brick and tile plant may be less than 5% free silica. Since the probability of contracting silicosis varies according to the amount of free silica inhaled, it is impossible to determine which processes or operations can be regarded as safe without a detailed analysis of them.

Since some of the materials to which exposures occurred are more important either from the standpoint of harmfulness or number of persons exposed, Tables 12, 13 and 14 were prepared to present a brief summary of the data.

Table 12 shows the materials to which 10% or more of the workers were exposed and lists the materials according to industry group. It can be seen from this table, for example, that more than 10% of the workers in the mining industry were exposed to several of the major materials and that exposures to other gases, coal dust, and excess humidity were greatest. It is also apparent that exposures to organic dust were major in the clothing, food and allied, leather, lumber, paper and printing, textile, and miscellaneous manufacturing industries. Three of the industry groups had more than 10% of the workers exposed to siliceous dust, and one to lead and compounds.

Table 13 also lists the important materials but according to number of persons exposed in all industries surveyed. It is evident from this table for example that 9,772 persons or 34.6% of the total were exposed to other metals, 6,253 or 22.3% to organic dusts, and 3,282 or 11.7% to dermatitis producers. It should be

TABLE 12

MATERIALS IN EACH INDUSTRY OR SERVICE GROUP SURVEYED TO WHICH 10 PER CENT
OR MORE WORKERS WERE EXPOSED

INDUSTRY OR SERVICE GROUP	Material	Number of Workers Exposed	
		%	No.
EXTRACTION OF MINERALS			
Mining.....	Other Gases	79.0	470
	Dust, Coal, Bituminous	72.9	434
	Excess Humidity	69.8	416
	Dust, Silicate	36.1	218
	Sulfur & Alkaline Sulfides	35.6	212
	Dust, Non-siliceous	21.3	127
	Carbon Monoxide	10.6	63
MANUFACTURING & MECHANICAL INDUSTRIES			
Chemical & Allied.....	Alkaline Compounds	23.1	237
	Other Gases	18.0	152
	Other Metals & Compounds	12.3	104
	Dust, Organic	11.4	96
Cigar & Tobacco.....	Dust, Organic	100.0	2
Clay, Glass & Stone.....	Dust, Silicate	57.1	1,011
	Dust, Siliceous	18.5	329
	Dust, Non-siliceous	13.1	232
Clothing.....	Dust, Organic	84.8	648
Food & Allied.....	Dust, Organic	20.9	1,238
Iron & Steel.....	Other Metals & Compounds	72.9	7,961
	Petroleum Products	21.5	2,356
	Dermatitis Producers	21.3	2,329
	Carbon Monoxide	19.6	2,142
	Dust, Siliceous	19.2	2,090
	Other Gases	18.3	2,000
	Excess Heat	16.5	1,806
Metals Other Than Iron & Steel...	Other Metals & Compounds	89.4	151
	Dust, Siliceous	45.0	76
	Carbon Monoxide	32.5	55
	Dermatitis Producers	26.6	45
	Excess Heat	24.8	42
	Petroleum Products	23.7	40
	Halogenated Hydrocarbons	21.9	37
	Dust, Non-siliceous	19.5	33
	Dust, Organic	14.2	24
	Chemicals, Inorganic	13.0	22
	Oils, Fats & Waxes	11.2	19
	Alkaline Compounds	10.1	17
Leather.....	Dust, Organic	41.9	255
Lumber & Furniture.....	Dust, Organic	83.7	1,863

TABLE 12 (cont'd)

INDUSTRY OR SERVICE GROUP	Material	Number of Workers Exposed	
		%	No.
Paper & Printing.....	Dust, Organic	33.0	230
	Lead & Compounds	29.3	204
	Inks	19.5	136
	Dermatitis Producers	15.5	108
	Other Metals & Compounds	11.6	81
	Hydrogen Sulfide	10.0	70
Textile.....	Dust, Organic	77.0	84
	Coal Tar Products	13.8	15
	Dermatitis Producers	12.8	14
	Dust, Silicate	12.8	14
Miscellaneous Manufacturing.....	Dust, Organic	29.8	894
	Other Metals & Compounds	25.4	761
	Dust, Non-siliceous	21.7	652
DOMESTIC & PERSONAL SERVICE			
Laundries & Dry Cleaning Plants..	Excess Heat	24.0	135
	Dust, Organic	19.5	110
	Organic Solvents	12.8	72
	Alkaline Compounds	12.6	71
	Carbon Monoxide	10.5	59

TABLE 13

NUMBER AND PERCENTAGE OF PERSONS EXPOSED TO SOME OF THE IMPORTANT MATERIALS IN SAMPLE SURVEYED

Material	Number of Persons Exposed	Percent of Total Workers Surveyed
GASES		
Other Gases	3,801	11.4
Carbon Monoxide	2,949	10.5
Sulfur Dioxide	491	1.7
SOLVENTS		
Petroleum Products	2,915	10.4
Other Organic Solvents	950	3.4
Alcohols, Esters, & Ethers	200	0.7
Halogenated Hydrocarbons	124	0.4
METALS & COMPOUNDS		
Other Metals	9,772	34.8
Lead & Compounds	390	1.4
Chromium & Compounds	34	0.1
DUSTS		
Organic	6,253	22.5
Siliceous	2,653	9.4
Silicate	2,040	7.3
Non-siliceous	2,007	7.1
Coal, Bituminous	1,150	4.1
CHEMICALS & ALLIED		
Dermatitis Producers	3,282	11.7
Oils, Fats, & Waxes	986	3.5
Alkaline Compounds	710	2.5
Chemicals, Inorganic	345	1.2
Infectious Materials	343	1.2
Paints & Enamels	324	1.2
Acids, Mineral	323	1.2
Chemicals, Organic	319	1.1
Cyanides	65	0.2

particularly noted that there occurred 2,653 exposures or 9.4% of the total to siliceous dust.

It was previously stated that in many cases a worker was exposed to more than one material, hence the total number of exposures was greater than the total number of workers. The data in explanation of this fact are shown in Table 14 wherein is shown the total number of plants and workers surveyed, the number and percent of workers exposed and the average number of exposures per person. It is shown for example that 21,416 or 75.8% of the 28,170 workers were exposed to one or more of the major materials. It also shows that there was a total of 46,521 exposures and an average of 2.2 exposures per exposed worker. The highest exposure rate was in the metals other than iron and steel group where the average was four materials per exposed person. In most of the other industries, the exposure rate was near the average.

A comparison of the exposure rates to some of the important materials with other States and a typical industrial area (1) where similar surveys have been made is shown in Table 15. It may be noted that the exposure to other metals and compounds in Iowa is considerably above the average whereas it is below the average to organic solvents, acids, and lead. The high rate to other metals may be due to the type of metal industries in the State or to a larger variety of metals being included in this classification. The low rates to organic solvents, acids, and lead are probably due to the absence of the class of industries using these materials. The other rates

¹ See reference on page 40.

TABLE 14

SUMMARY OF EXPOSED WORKERS AND EXPOSURES IN EACH INDUSTRY AND SERVICE GROUP

INDUSTRY OR SERVICE GROUP	Total Number of Plants	Total Number of Workers	Total Number of Ex- posed Workers	Percent of Ex- posed Workers	Total Number of Exposures	Exposures Per Ex- posed Worker
ALL INDUSTRIES	414	23170	21416	75.8	46521	2.2
EXTRACTION OF MINERALS	10	596	590	97.3	2015	3.5
Bituminous Coal	8	463	448	96.8	1762	3.9
Gypsum	2	133	132	99.4	253	1.9
MANUFACTURING & MECHANICAL	359	27011	20524	75.9	39259	1.9
Chemical & Allied	28	844	657	77.9	1446	2.2
Cigar & Tobacco	1	2	2	100.0	2	1.0
Clay, Glass & Stone	52	1771	1563	88.2	2382	1.5
Clothing	14	765	634	82.9	671	1.1
Food & Allied	46	5900	2996	50.8	4102	1.4
Iron & Steel	101	10912	9784	89.7	25182	2.6
Metals Other Than Iron & Steel	7	169	161	95.3	642	4.0
Leather	11	609	265	43.6	527	2.0
Lumber & Furniture	29	2228	1722	77.3	2987	1.7
Paper, Printing & Allied	30	696	601	86.4	1245	2.1
Textile	10	109	99	90.8	176	1.8
Miscellaneous	50	3006	2040	68.0	4426	2.2
DOMESTIC & PERSONAL SERVICE	45	563	312	55.4	734	2.5
Laundries	8	232	80	34.5	133	1.7
Dry Cleaning & Pressing Plants	37	331	232	70.2	651	2.8

COMPARISON OF PERCENTAGE OF

Material	Iowa
Other Metals & Compounds	34.8
Dust, Organic	22.3
Dermatitis Producers	11.7
Other Gases	11.4
Carbon Monoxide	10.5
Petroleum Products	10.4
Dust, Siliceous	9.4
Dust, Silicate	7.3
Dust, Non-siliceous	7.1
Organic Solvents ¹	4.5
Dust, Coal ²	4.2
Oils, Fats & Waxes	3.5
Alkaline Compounds	2.5
Chemicals ³	2.3
Acids ⁴	1.7
Sulfur Dioxide	1.7
Lead & Compounds	1.4
Infectious Materials	1.2
Paints & Enamels	1.2
Cyanides	0.2
Chromium & Compounds	0.1

Each (—) indicates less than 0.1%.

1. Includes Alcohols, Esters & Etheraldehydes.

2. Includes Dust, Coal, Anthracite, Bit.

3. Includes Gases, Organic Solvents, Alkalies, etc.

4. Includes Acids, Mineral, & organic, etc.

TABLE 15

COMPARISON OF PERCENTAGE OF EXPOSURES TO SOME OF IMPORTANT MATERIALS IN IOWA WITH PERCENTAGE IN OTHER STATES AND AREAS

Percentage of Workers Exposed to Indicated Material

Material	Iowa	Illinois	Idaho	Colorado	Maryland	Utah	Texas	Virginia	South Carolina	New Hampshire	Typical Industrial Area	Average Including Iowa
Other Metals & Compounds	34.8	12.2	19.8	28.5	10.0	14.6	26.2	6.0	0.1	8.2	NL	16.0
Dust, Organic	22.3	13.3	23.1	18.5	10.7	17.3	33.1	31.4	58.7	34.4	NL	26.3
Dermatitis Producers	11.7	11.9	60.5	22.0	9.1	16.5	18.7	3.9	10.4	3.5	NL	16.8
Other Gases	11.4	6.3	32.1	28.5	2.3	21.7	22.7	5.4	0.5	2.4	2.5	12.3
Carbon Monoxide	10.3	5.8	29.1	27.6	13.8	12.0	22.5	6.7	NL	6.2	19.3	13.3
Petroleum Products	10.4	6.0	27.1	15.2	NL	18.0	32.4	10.0	4.3	9.7	NL	14.8
Dust, Siliceous	9.4	6.5	27.2	20.5	2.6	32.4	8.5	6.2	1.3	3.5	9.0	11.6
Dust, Silicate	7.3	9.5	7.7	17.1	1.2	27.4	0.9	22.2	1.3	6.2	5.0	9.6
Dust, Non-siliceous	7.1	5.2	4.0	9.4	6.7	33.9	9.9	4.5	0.3	3.5	NL	8.4
Organic Solvents ¹	4.5	9.7	17.6	9.5	6.0	5.1	13.4	5.8	1.1	11.9	35.5	10.9
Dust, Coal ²	4.2	3.0	5.7	10.1	2.3	11.6	1.1	15.7	0.7	1.9	NL	5.6
Oils, Fats & Waxes	3.5	2.7	4.0	3.3	9.4	4.3	12.2	2.2	0.7	4.8	NL	4.7
Alkaline Compounds	2.5	3.9	8.2	8.0	2.1	3.2	14.3	3.5	2.4	6.8	NL	5.5
Chemicals ³	2.3	0.4	3.3	7.4	3.0	—	2.0	1.9	NL	0.5	NL	2.6
Acids ⁴	1.7	3.2	8.2	5.6	2.5	3.0	13.5	2.7	2.5	2.3	NL	5.0
Sulfur Dioxide	1.7	0.6	5.2	2.6	4.3	5.2	5.9	4.0	0.1	2.1	1.4	3.0
Lead & Compounds	1.4	5.7	19.8	8.9	5.3	20.7	14.6	3.5	0.1	2.2	10.2	8.4
Infectious Materials	1.2	2.2	3.0	7.0	0.1	1.5	5.8	1.1	NL	0.2	NL	2.5
Paints & Enamels	1.2	1.4	2.4	2.4	1.3	1.1	1.9	1.3	0.2	0.7	NL	1.4
Cyanides	0.2	0.8	1.1	0.8	0.4	1.0	0.2	0.4	—	0.1	2.0	0.7
Chromium & Compounds	0.1	1.4	0.1	0.3	0.4	0.2	—	0.1	—	0.9	1.3	0.5

Dash (—) indicates less than 0.1%.

NL - Not listed in report from indicated state or area.

1. Includes Alcohols, Esters & Ethers; Halogenated Hydrocarbons; & Organic Solvents, Not Otherwise Classified.

2. Includes Dust, Coal, Anthracite; & Dust, Coal, Bituminous.

3. Includes Chemicals, Inorganic; & Chemicals, Organic.

4. Includes Acids, Mineral; & Acids, Organic.

appear to be near the average which fact is more significant than a few rates being above or below the average as it indicates that conditions in Iowa are similar to those in other States.

One of the questions of chief concern to the Division of Industrial Hygiene is "How many persons engaged in industrial pursuits are exposed to materials which may constitute a health hazard"? An approximate answer to this question is presented by Table 16 which shows the expected number of persons in Iowa exposed to some of the important materials. The figures given therein are based on the number of persons exposed as found by the survey, and the 1930 census figures for number of persons in each industrial group as shown in the first line. Since all the materials to which exposures were observed do not appear in this table and furthermore, since all industrial groups were not covered by the survey, the total number of exposures is somewhat higher than shown. There may be some discrepancies because of changes in population among the industrial groups since 1930 but it is believed that the figures are sufficiently accurate to use as a basis for future studies and investigations.

Among the important materials is carbon monoxide with approximately 17,700 expected exposures. This figure, particularly, is probably lower than the actual, as many exposures to the gas will likely be found in garages and automotive repair shops which were not included in the survey. Other important exposures are 11,800 to dermatitis producers, 9,320 to organic solvents, approximately

TABLE 16

EXPECTED NUMBER OF PERSONS IN IOWA EXPOSED TO SOME OF THE IMPORTANT MATERIALS BASED ON DATA OBTAINED IN SURVEY

Expected Number of Persons Exposed to Indicated Materials in Types of Industries Shown

Extraction of Minerals

Manufacturing and Mechanical Industries

	Total	Coal Mines	Gypsum Mines	Chemical & Allied	Cigar & Tobacco	Clay, Glass, Clothing & Stone	Food & Allied	Iron & Steel	Other Metals	Leather	Lumber & Furniture	Paper & Printing	Textile	Misc. Mfg.	Domestic & Personal Service Laun- dries	Cleaning & Pressing Plants	
ALL WORKERS (1930 Census)	153168	7759	163	4445	583	5324	4276	26106	32047	1435	1351	7239	8743	1730	26762	3739	1406
ALL EXPOSED WORKERS (Based on Survey)	101000	7520	167	3460	583	4700	3540	13500	23700	1370	589	5600	7550	1620	18200	1290	985
Materials or Conditions*																	
Other Metals & Compounds	39000	101	16	737	--	260	8	1182	20445	1430	177	1083	1052	7	12441	--	--
Acid, Organic	32000	--	16	327	349	59	3158	4730	4236	107	565	5392	2606	1700	8160	146	429
Other Cases	20500	7120	59	1143	--	267	--	739	6031	--	--	148	342	6	4398	258	26
Carbon Monoxide	17700	237	59	563	--	438	--	1732	9965	55	14	143	721	6	3200	405	145
Coal, Bituminous	12000	7260	2	495	--	522	--	169	1668	7	14	31	37	6	1681	83	--
Latent Producers, NOC	11800	--	8	78	--	137	--	3362	5446	45	12	541	1058	43	1085	15	--
Acid, Silicate	11700	3525	7	111	--	3115	20	356	3441	--	14	98	98	43	780	34	15
Organic Solvents, NOC	9320	--	--	94	--	14	35	54	5804	89	71	406	312	199	1936	--	307
Excess Humidity	8340	6970	--	--	--	--	27	550	--	--	--	--	116	--	--	677	--
Petroleum Products	7460	--	--	119	--	251	--	343	5137	40	12	423	159	--	959	15	--
Acid, Siliceous	6490	668	--	36	--	1051	--	14	3658	480	18	306	39	--	206	--	--
Acid, Non-siliceous	5840	--	160	204	--	696	--	72	1317	447	--	69	39	--	2839	--	--
Alkalis, Fats, & Waxes	5550	--	--	237	--	--	--	3515	907	19	40	242	184	15	310	--	34
Acid & Compounds	4830	--	--	133	--	10	--	14	662	176	76	48	3607	--	104	--	--
Alkaline Compounds	4820	--	--	969	--	33	--	857	1335	764	51	--	185	9	202	273	229
Carbon Dioxide	4210	70	--	357	--	134	--	233	1525	--	51	29	21	6	1652	83	--
Excess Heat	3000	--	--	366	--	50	--	580	970	42	--	--	90	--	236	64	557
Acid, Mineral	2910	--	--	17	--	2	--	506	779	512	51	--	268	6	533	34	200
Acids, Organic, NOC	2580	--	--	130	--	4	8	60	31	9	51	180	69	--	1339	--	200
Acids, Inorganic, NOC	2160	--	--	196	--	97	--	376	102	686	55	--	231	--	295	64	9
Acid & Enamel	1880	--	--	59	--	8	--	31	1134	86	43	71	--	7	443	--	--
Acidulous Materials	1540	--	--	202	--	--	--	1010	2	--	122	--	--	--	--	--	--
Alcohols, Esters & Ethers	1110	--	--	101	--	1	--	5	199	87	--	64	374	9	70	--	200
Organic Hydrocarbons	765	--	--	13	--	2	--	36	953	37	--	72	--	--	357	--	204
Aldehydes	732	--	--	--	--	--	--	--	151	509	--	--	54	--	38	--	--
Acid & Compounds	329	--	--	--	--	--	--	16	170	51	--	--	16	--	76	--	--

NOC - Not otherwise classified.

Dash (--) indicates no exposures to indicated material found in survey.

* Totals in first column are expressed to three significant figures.

6,500 to siliceous dust, and almost 5,000 to lead and its compounds. Some conception of the magnitude of the problems can be had from these figures.

Application of Control Measures.

Occupational exposure to harmful materials can be controlled by several different methods. Bloomfield¹ specifies four different methods to be used where a toxic material is essential to the operation and a non-toxic material cannot be substituted. They are as follows: (1) isolation of the harmful process, (2) wet methods in the case of some dusty processes, (3) exhaust ventilation, and (4) personal protective equipment such as respirators, gloves, etc.

In this survey the control measures in each plant were recorded and the general data presented in Tables 17 to 19 inclusive. Detailed data on control measures are shown in tables accompanying the discussions of each industrial group. It should not be inferred that the mere presence of a control measure indicates a harmless process for in many cases control measures may be inadequate. Neither should it be inferred that a control measure is necessary for every exposure because in some cases an actual hazard may not exist. The data, however, can be used as an indication of the recognition on the part of industry of potential hazards, health, or otherwise.

Table 17 shows the total number of exposures revealed by the survey and the number of persons exposed having the indicated type of control. For example, in all industries surveyed, there

¹ Bloomfield, J. J., "Engineering Control of Occupational Diseases", Public Health Reports, Vol. 51, No. 21, May 22, 1936. Government Printing Office.

were 46,521 exposures to the specified materials. Positive ventilation was provided for 5.7% of the workers exposed, negative ventilation for 6.5%, local exhaust ventilation for 15.0%, enclosed process for 0.8%, etc. The term "positive ventilation" designates those systems which blow air into a room such as a propeller fan situated in a window and taking suction from outside. Negative ventilation is a system which draws air from the room, discharging outside. Local exhaust designates a system consisting of hood, air duct and fan so constructed to remove the material at or near its source of generation. An enclosed process is, as the term indicates, enclosed to prevent dissemination of the material, such as a sandblast cabinet. Protective clothing includes gloves, aprons, leggings, goggles, etc. Other methods include natural ventilation of mines, outside work, open windows, automatically controlled temperatures, protective skin creams, and other such appliances or conditions which may have an effect of minimizing the harmfulness of the operation. Data obtained on respirators included whether the type in use was approved by the U. S. Bureau of Mines. These data were not tabulated but it should be said that many of them were not approved for protection against the material to which the worker was exposed.

In a perusal of these data it should be remembered that a worker may be exposed to more than one material and also that more than one control measure may be provided for a single material. For example, in the sandblasting operation a cabinet may be used to en-

Materials

ALL SPECIFIED MATERIALS	1970	1971	1972	1973	1974	1975	1976	1977
Other Metals & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust, Organic	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dermatitis Producers, NOC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Other Gases	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Carbon Monoxide	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Petroleum Products	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust, Siliceous	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Excess Heat	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust, Silicate	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust, Non-siliceous	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust, Coal, Bituminous	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Oils, Fats & Waxes	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Organic Solvents, NOC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Alkaline Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Excess Humidity	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulfur Dioxide	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulfur & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Chemicals, Inorganic, NOC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Infectious Materials	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Inks	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Paint & Enamel	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Acids, Mineral	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Chemicals, Organic, NOC	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lacquer & Varnish	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Alcohols, Esters & Ethers	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dyes	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Acids, Organic	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Halogenated Hydrocarbons	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Coal Tar Products	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Hydrogen Sulfide	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Analytical Chemicals	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Cyanides	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Antimony & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Medicinals	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Chromium & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust, Asbestos	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dust, Coal, Anthracite	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Accelerators	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Aldehydes	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Cadmium & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fluorine & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Aniline & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Mercury & Compounds	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Each (—) indicates data available.
 N/A - Not Applicable

TABLE 17

PERCENT OF PERSONS EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Percent of Exposures Having Specified Control

Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	46521	5.7	6.5	15.0	0.8	1.8	0.1	2.6	0.3	5.0	5.5
Other Metals & Compounds	9772	2.2	6.4	11.7	0.6	1.6	—	2.2	0.2	10.2	0.6
Dust, Organic	6253	1.7	5.4	25.2	0.6	0.2	—	2.8	—	2.1	0.4
Dermatitis Producers, NOC	3282	—	5.4	6.8	—	—	—	—	—	1.5	7.3
Other Gases	3202	14.9	10.5	15.5	2.4	—	1.2	0.6	1.0	—	5.4
Carbon Monoxide	2949	4.0	12.6	18.5	1.1	—	0.7	0.6	1.1	0.3	3.2
Petroleum Products	2915	0.4	6.9	4.7	—	—	—	0.5	—	1.5	5.7
Dust, Siliceous	2653	5.8	15.9	18.8	1.8	4.2	—	3.0	0.9	9.9	4.4
Excess Heat	2321	2.5	11.2	1.2	—	—	—	—	—	—	37.8
Dust, Silicate	2040	13.3	1.2	15.1	0.6	12.0	—	7.0	—	6.7	8.3
Dust, Non-siliceous	2007	3.5	1.4	29.2	0.1	14.0	—	3.5	0.3	6.4	4.8
Dust, Coal, Bituminous	1150	43.6	5.8	8.9	1.0	1.0	—	0.5	—	7.4	18.0
Oils, Fats & Waxes	986	0.2	12.5	17.5	1.9	—	—	1.6	—	2.7	1.8
Organic Solvents, NOC	950	1.6	4.0	21.9	1.8	—	—	10.0	—	2.9	3.9
Alkaline Compounds	710	2.0	4.4	15.5	2.1	0.1	—	6.9	—	18.5	3.7
Excess Humidity	660	61.1	1.1	—	—	—	—	—	—	—	5.2
Sulfur Dioxide	491	2.4	—	21.2	1.8	0.4	0.4	1.4	2.2	—	10.2
Lead & Compounds	390	1.0	4.4	29.7	1.0	—	—	9.7	0.3	6.2	3.1
Sulfur & Compounds	350	62.0	6.9	2.9	4.9	—	—	2.9	1.4	5.1	5.1
Chemicals, Inorganic, NOC	345	—	0.9	13.0	3.2	—	—	1.7	—	8.4	13.9
Infectious Materials	343	—	—	1.2	—	—	—	—	—	9.0	—
Inks	329	—	0.6	0.3	—	—	—	—	—	0.6	—
Paint & Enamel	324	1.2	0.6	28.7	—	—	—	22.8	0.3	3.7	1.2
Acids, Mineral	323	—	4.3	16.7	1.9	—	—	2.5	—	18.3	2.2
Chemicals, Organic, NOC	319	—	1.9	31.0	5.0	0.6	—	1.6	—	4.1	2.5
Lacquer & Varnish	237	5.8	11.0	47.3	—	—	—	27.4	—	2.1	—
Alcohols, Esters & Ethers	200	—	7.0	24.0	—	—	—	15.5	—	7.0	5.0
Dyes	143	—	0.7	1.4	—	—	—	2.8	—	4.2	—
Acids, Organic	139	—	4.3	5.0	—	—	—	32.4	—	32.4	5.8
Halogenated Hydrocarbons	124	—	4.0	10.5	—	—	—	—	—	—	32.2
Coal Tar Products	111	4.5	0.9	—	9.0	—	—	3.6	—	—	13.5
Hydrogen Sulfide	102	4.9	—	—	—	—	—	4.9	—	—	3.9
Analytical Chemicals	97	—	—	9.3	—	—	—	—	—	—	—
Cyanides	65	—	4.6	61.5	—	—	—	1.5	—	29.2	—
Antimony & Compounds	52	—	5.8	34.6	3.8	—	—	—	—	—	—
Medicinals	42	—	—	—	—	—	—	2.4	—	—	—
Chromium & Compounds	34	—	2.9	56.0	—	—	—	—	—	64.7	1.2
Dust, Asbestos	33	—	—	—	—	—	—	—	—	—	—
Dust, Coal, Anthracite	30	—	—	86.5	—	—	—	—	—	—	—
Accelerators	25	—	—	40.0	—	—	—	—	—	—	—
Aldehydes	9	—	—	100.0	—	—	—	—	—	—	—
Cadmium & Compounds	7	—	14.3	42.9	—	—	—	—	—	85.8	—
Fluorine & Compounds	4	—	—	—	—	—	—	50.0	—	—	—
Aniline & Compounds	2	—	—	—	—	—	—	—	—	—	—
Mercury & Compounds	2	—	—	50.0	—	—	—	50.0	—	—	—

Dash (—) indicates less than 0.1%.
 NOC - Not otherwise classified.

close the process while the workman directs the operation from the outside. Thus, he would be recorded as having control under "enclosed process". Most sandblast cabinets, however, are equipped with an exhaust fan with discharge into a filter. Hence, with this system, the worker would be recorded as having control under "enclosed process", and also under "exhaust ventilation". If, in addition, the worker wore a respirator, control would also be recorded under "personal respiratory protection" making, in this case, a total of three controls for one exposure. It is believed that the data is of particular importance insofar as indicating the type of control measures in effect for the various materials rather than an indication of the number of persons having controlled exposures in the group as a whole.

The prevalence of the various types of control measures for each industrial group is shown in Table 18. It shows, for example, that exhaust ventilation was provided for 17.9% of the exposures in the manufacturing and mechanical industry, to 1.6% in the extraction of minerals industry, and to 10.3% in the domestic and personal service group. It is interesting to note that the use of personal respiratory equipment was not prevalent in any of the industries surveyed.

The data on exposed workers and control measures are briefly summarized in Table 19. It shows the number of workers having an exposure to one or more of the specified materials in

INDUSTRY OR SERVICE GROUP

ALL INDUSTRIES

EXTRACTION OF MINERALS

Bituminous Coal

Gypsum

MANUFACTURING & MECHANICAL

Chemical & Allied

Cigar & Tobacco

Clay, Glass & Stone

Clothing

Food & Allied

Iron & Steel

Metals Other Than Iron

Leather

Lumber & Furniture

Paper, Printing & Allied

Textile

Miscellaneous Manufactures

DOMESTIC & PERSONAL SERVICES

Laundries

Dry Cleaning & Pressing

TABLE 13

PERCENT OF EXPOSURES HAVING INDICATED TYPE OF HAZARD CONTROL IN EACH INDUSTRY AND SERVICE GROUP

INDUSTRY OR SERVICE GROUP	Total Number of Exposures	Ventilation				Personal Respiratory Protection					
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL INDUSTRIES	46521	5.7	6.5	15.0	0.8	1.3	0.1	2.6	0.3	5.0	5.5
EXTRACTION OF MINERALS	2015	81.2	2.0	1.6	—	0.6	—	—	—	0.2	8.6
Bituminous Coal	1762	85.4	2.3	0.3	—	0.7	—	—	—	—	9.9
Gypsum	253	51.0	—	10.7	—	—	—	—	—	1.2	—
MANUFACTURING & MECHANICAL	38259	2.4	7.6	17.9	1.0	2.1	0.2	3.1	0.3	6.1	6.1
Chemical & Allied	1445	5.6	1.0	12.0	6.5	—	2.4	3.6	5.9	4.1	16.3
Cigar & Tobacco	2	—	—	—	—	—	—	—	—	—	—
Clay, Glass & Stone	2382	—	—	8.2	1.0	11.8	—	2.4	0.7	2.5	20.6
Clothing	671	—	—	—	—	—	—	—	—	—	—
Food & Allied	4102	—	0.2	15.5	1.4	—	0.5	1.6	—	1.3	0.8
Iron & Steel	25182	3.0	10.5	14.4	0.8	0.9	—	3.2	0.1	7.5	5.8
Metals Other Than Iron & Steel	642	0.2	4.7	50.2	0.3	0.3	—	—	—	3.3	1.4
Leather	527	0.4	0.4	5.5	0.4	—	—	0.8	—	18.4	—
Lumber & Furniture	2987	—	—	32.5	—	—	—	2.5	—	1.6	1.1
Paper, Printing & Allied	1245	3.9	8.9	15.0	0.4	0.2	—	—	—	1.0	0.8
Textile	176	—	1.1	9.7	—	—	—	3.4	—	8.5	23.8
Miscellaneous Manufacturing	4426	1.1	1.5	18.9	0.2	7.0	—	2.7	—	1.5	0.4
DOMESTIC & PERSONAL SERVICE	784	—	6.4	10.3	—	—	—	0.3	—	0.5	7.8
Laundries	133	—	—	—	—	—	—	1.5	—	2.3	—
Dry Cleaning & Pressing Plants	651	—	7.7	12.4	0.2	—	—	—	—	0.2	9.4

Dash (—) indicates less than 0.1%.

plants with more than 100 workers and in plants with less than 100 workers. It also shows the number of exposed workers who were provided with one or more control measures. Thus, from these data conditions in regard to exposures and control measures in the smaller size plants can be compared to those in the larger size. For example, in the iron and steel group, 9,784 of the 10,912 workers surveyed were exposed to one or more of the materials. Ninety and one-tenth percent or 8,119 of the workers in the larger plants and 87.6% or 1,665 of the workers in the smaller plants were exposed. The table also shows that 43.2% or 3,498 of the workers exposed in the larger plants were provided with control measures whereas 33.8% or 563 of the workers in the smaller plants were provided with control measures.

With reference to all industries surveyed, the greatest percentage of workers exposed occurred in the smaller plants, but the greatest percentage of exposed workers having control measures occurred in the larger plants. In the larger plants 75% of the workers had one or more exposures with 41.1% provided with control measures whereas in the smaller plants 79.2% had one or more exposure with 32.3% provided with control measures.

However, the largest percentage of exposed workers provided with control measures did not in all cases exist in the larger plants. For instance, in the clay, glass and stone group, 30.1% of the exposed workers in small plants had control measures but only 21.8% in the larger plants had control measures. A similar condition existed in

the chemical and allied, leather, paper and printing, and miscellaneous manufacturing groups. On the other hand, it is shown that in the majority of cases a greater percentage of the workers in the smaller plants was exposed to the various materials in comparison to the larger plants. For example, in the clay, glass and stone industry, 95.4% of the workers in the smaller plants had one or more exposures whereas in the larger plants 85.2% of the workers had one or more exposures. Similarly in the miscellaneous manufacturing group 83.1% of the workers in the smaller plants were exposed, as against 72.3% in the larger. If proper balance was maintained, the higher percentage of workers with controls should go hand in hand with the higher percentage of workers exposed, but this is not the case, as several of the groups show a higher percentage of workers exposed in the smaller plants but a higher percentage of workers having control measures in the larger plants.

NUMBER AND PERCENTAGE OF THE TOTAL POPULATION OF THE UNITED STATES, BY SEX, COLOR, AND NATIVITY, IN 1900

INDUSTRY	WHITE		BLACK		HISPANIC		NATIVE		FOREIGN	
	NO.	PERCENT	NO.	PERCENT	NO.	PERCENT	NO.	PERCENT	NO.	PERCENT
ALL SURVEYED INDUSTRIES	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
EXTRACTION OF MINERALS	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Bituminous Coal	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Gypsum	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
MANUFACTURING & CONSTRUCTION	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Chemical & Allied	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Cigar & Tobacco	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Clay, Glass & Pottery	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Clothing	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Food & Allied	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Iron & Steel	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Metals	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Leather	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Lumber & Wood	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Paper, Printing & Bookbinding	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Textile	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Miscellaneous	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
DOMESTIC SERVICES	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Laundry	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0
Dry Cleaning & Dressmaking	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0	1,000,000	100.0

TABLE 19

NUMBER AND PERCENTAGE OF WORKERS HAVING POTENTIAL EXPOSURE TO ONE OR MORE SPECIFIED MATERIALS, AND NUMBER AND PERCENTAGE OF POTENTIALLY EXPOSED WORKERS PROVIDED WITH ONE OR MORE FORMS OF EXPOSURE CONTROL

INDUSTRY OR SERVICE GROUP	Number of Workers in Industry Group			Number and Percentage of Workers in Industry Group Having a Potential Exposure to One or More Specified Materials						Number and Percentage of Exposed Workers in Industry Group Having One or More Forms of Exposure Control					
	All Plants Surveyed	Plants With 100 or More Workers	Plants With Less Than 100 Workers	All Plants Surveyed		Plants With 100 or More Workers		Plants With Less Than 100 Workers		All Plants Surveyed		Plants With 100 or More Workers		Plants With Less Than 100 Workers	
				No.	%	No.	%	No.	%	No.	%	No.	%		
ALL SURVEYED INDUSTRIES	28170	20842	7328	21416	75.8	15612	75.0	5804	79.2	8295	33.7	6422	41.1	1873	32.3
EXTRACTION OF MINERALS	596	371	225	580	97.3	356	95.0	224	99.5	491	84.6	333	93.6	158	70.6
Bituminous Coal	463	371	92	448	96.8	356	95.0	92	100.0	419	93.4	333	93.6	86	93.5
Gypsum	133	—	133	132	99.4	—	—	132	99.2	72	54.6	—	—	72	54.5
MANUFACTURING & MECHANICAL	27011	20471	6540	20524	75.9	15253	74.4	5268	80.7	7750	37.8	6089	39.9	1661	31.5
Chemical & Allied	844	260	584	657	77.9	187	72.0	470	80.6	174	26.5	18	9.6	156	33.2
Cigar & Tobacco	2	—	2	2	100.0	—	—	2	100.0	—	—	—	—	—	—
Clay, Glass & Stone	1771	1216	555	1563	88.2	1034	85.2	529	95.4	384	24.6	225	21.8	159	30.1
Clothing	765	444	321	634	82.9	393	89.6	236	73.5	—	—	—	—	—	—
Food & Allied	5900	5127	773	2996	50.8	2432	47.8	544	70.4	645	21.5	571	23.3	74	13.6
Iron & Steel	10912	9012	1900	9784	89.7	8119	90.1	1665	87.6	4061	41.6	3498	43.2	563	33.8
Metals Other Than Iron & Steel	169	—	169	161	95.3	—	—	161	100.0	74	46.0	—	—	74	45.9
Leather	609	329	280	265	43.6	123	38.9	137	48.9	43	16.2	7	5.5	36	26.3
Lumber & Furniture	2228	1800	428	1722	77.3	1395	77.5	327	76.4	1300	75.5	1128	80.7	172	52.6
Paper, Printing & Allied	696	136	560	601	86.4	119	87.5	482	86.0	137	22.8	24	20.2	113	23.5
Textile	109	—	109	99	90.8	—	—	99	90.9	10	10.2	—	—	10	10.1
Miscellaneous Manufacturing	3006	1833	859	2040	68.0	1327	72.3	713	83.1	922	45.2	570	43.0	352	49.4
DOMESTIC & PERSONAL SERVICE	563	—	563	312	55.4	—	—	312	55.4	54	17.3	—	—	54	17.3
Laundries	232	—	232	80	34.5	—	—	80	34.5	2	2.5	—	—	2	2.5
Dry Cleaning & Pressing Plants	331	—	331	232	70.2	—	—	232	70.2	52	22.4	—	—	52	70.2

Dash (—) Indicates no Exposures to Indicated Material Found in Survey.

CONCLUSIONS

This survey, undertaken to evaluate the industrial hygiene problems of the State, discloses the fact that a large percentage of the gainfully employed persons in Iowa industries is exposed, through handling or otherwise, to materials which may be potentially hazardous to health. Statistics of the 1930 U. S. Census show that most of the 3,698 manufacturing and mining establishments employ less than 20 persons, but that most of the workers in these industries are distributed quite uniformly in plants with five to 2,500 workers. Hence, an industrial hygiene program designed to reach the largest number of workers should be centered among those plants having from 100 to 250 workers and should include those having from five to 2,500 workers. Conditions in Iowa are comparable to those in other States where similar surveys have been made. Some of the larger establishments are now carrying on effective programs of industrial hygiene but the percentage of these plants is small. Almost half the workers surveyed did not have the services of a safety director and very few of the workers were provided with the services of a physician or nurse as integrated with an industrial hygiene program. Workman's compensation insurance is provided for a large number of workers and records of accidents are maintained in most plants. However, practically half the workers were not subjected to sickness records and there is a definite lack of morbidity statistics in regard to occupational illness. The lack of industrial welfare facilities is

especially noticeable among those plants with less than 100 workers.

From observations of workroom environments, it is apparent that approximately three-fourths of the 28,170 workers surveyed were exposed to potentially hazardous materials and conditions, and that the average exposure was 2.2 materials per person. Using these data as a basis, it is estimated that there are approximately 101,000 workers exposed in the entire industries from which the representative sample was taken, and that there are a total of approximately 220,000 exposures in these industries. More than 45,000 of these exposures can be expected to various gases, chief of which is carbon monoxide - colorless, odorless, tasteless and therefore not noticeable except by its chronic effect upon the health. More than 56,000 can be expected to be exposed to various dusts including approximately 6,500 to silica, the causative agent of the much publicized disease Silicosis. Eighteen thousand or more persons may be expected to be exposed to the various organic solvents which are widely used in industry and which are constantly being changed in composition. It is impossible to predict the effects of the newer solvents as changes in composition are likely to change their toxicity. It is known, however, that many of them create hazardous conditions. Nearly 45,000 exposures may be expected to occur to various metals and their compounds some of which are capable of producing serious deleterious effects. Nearly 5,000 exposures can be expected to lead and its compounds, one of the oldest recognized metals causing occupational illness.

All industrial groups were not included in the survey and it is, therefore, probable that the number of exposures is actually greater than estimated since some of the operations and processes in the excluded groups involve the use of potentially hazardous materials.

The fact that these materials are recognized by some of the industrial officials as being potentially hazardous is indicated by the use of control measures. The data shows, however, that more than half the exposed workers in the large size plants and more than two-thirds of the exposed workers in the smaller plants are not provided with control measures. Furthermore, the mere existence of a control measure does not mean that it is adequate and proper. To determine whether existing controls are effective and to determine whether additional measures are needed will necessitate further scientific study and investigation.

The factual data collected through this survey present an approach to the problems of occupational disease control and the promotion of better health among the working population.

Extraction of Minerals

The major industry under this group is the mining of bituminous coal. According to the records of the State Mine Inspector for the year 1937, there were 222 mines employing 1,330 workers. Other industries under this classification are the granite mines and the quarries for extraction of limestone, sand, and gravel.

DETAILS

Tables 20 and 21 show the number of workers in the ten mines selected for survey, and the number of workers exposed to the various materials. From quarries and operations for the extraction of sand or gravel were not included in the survey. It will be noted that the largest number of workers are in the "other mines", which is the majority of cases in surface mining (black lung). Table 21 shows

OF

MATERIAL EXPOSURES AND CONTROL MEASURES

FOR EACH INDUSTRY SURVEYED

Table 22 shows that 122 workers were exposed to the various materials. Of these were exposed to dust. It also shows that 14.2% of the workers in coal mining operations and 14.2% in the granite mining operations were exposed to these gases. Table 23 shows that 14.2% of the total exposures occurred in the coal mines and the remaining 8.8% occurred in granite mines or sand and gravel operations. Table 24 shows that

In regard to the exposures to dust, the data show that 14.2% of the coal mine workers were exposed to bituminous coal dust, 48.4% to siliceous dust and 3.4% to alluvial dust. It should be explained, however, that these exposures were recorded on the basis of known materials only and that the exposures to alluvial dust may be properly higher should a chemical analysis of the coal dust show free silica to be present. It was not within the scope of this survey

Extraction of Minerals

The major industry under this group is the mining of bituminous coal. According to the records of the State Mine Inspector for the year 1938, there were 381 mines employing 8,500 workers. Other industries under this classification are the gypsum mines and the quarries for extraction of limestone, sand, and gravel.

Tables 20 and 20a show the number of workers in the ten mines selected for survey, and the number of workers exposed to the various materials. Stone quarries and operations for the extraction of sand or gravel were not included in the survey. It will be noted that the largest number of exposures are to "other gases", which in the majority of cases is carbon dioxide (black damp). Table 20 shows that 596 workers were covered by the survey, 79% of whom were exposed to these gases. It also shows that 91.7% of the workers in coal mining operations and 84.8% in the gypsum mining operations were exposed to these gases. Table 20a shows that 90.3% of the total exposures occurred in the coal mines and the remaining 9.7% occurred in gypsum mines.

In regard to the exposures to dust, the data show that 93.5% of the coal mine workers were exposed to bituminous coal dust, 48.4% to silicate dust and 8.6% to siliceous dust. It should be explained, however, that these exposures were recorded on the basis of known materials only and that the exposures to siliceous dusts may be properly higher should a mineral analysis of the coal dust show free silica to be present. It was not within the scope of this survey

to make such analyses but they would be made in a detailed study of the industry if such a study was instituted in the future. In this respect, it is interesting to note that a study of anthraco-silicosis among hard coal miners¹ made by the U. S. Public Health Service revealed the fact that the disease occurred among miners exposed to coal dust which upon analysis was found to contain a small percentage of free silica. It should not be construed, however, from the foregoing discussion that silicosis is probable in Iowa coal mines.

Table 20b shows the control measures for this industry. The State mining law specified that "the operator of any mine shall provide and maintain an amount of ventilation of not less than one hundred cubic feet of air per minute for each person employed in the mine and not less than 500 cubic feet of air per minute for each animal used therein, which shall be so circulated throughout the mine as to dilute, render harmless, and expel all noxious and poisonous gases in all working parts of the mine." It may be seen from the table that a large percentage of the workers in the mining industry were provided with some means of mechanical ventilation. Positive ventilation appears to be the most prevalent type, with some of the smaller mines having natural ventilation. Whether these systems are adequate for dust control insofar as health hazards are concerned can only be determined by detailed studies of the operations.

The mining law also specifies that shot firemen shall be provided with an efficient gas mask. These have been recorded under "other methods" as the type used is not worn except in case of emergency.

¹ P. H. Bulletin 221, U. S. Treasury Department, Public Health Service.

TABLE 20

MINES - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to
Specified Materials

MATERIALS	All Mines		Bituminous Coal		Gypsum	
NUMBER OF WORKERS SURVEYED	596		463		133	
	No.	%	No.	%	No.	%
Other Gases	470	79.0	424	91.7	46	34.6
Dust, Coal, Bituminous	434	72.9	433	93.5	1	0.8
Excess Humidity	416	69.8	416	89.8	0	—
Dust, Silicate	215	36.1	210	45.4	5	3.8
Sulfur & Alkaline Sulfides	212	35.6	212	45.8	0	—
Dust, Non-siliceous	127	21.3	0	—	127	95.5
Carbon Monoxide	63	10.6	17	3.7	46	34.6
Dust, Siliceous	40	6.7	40	8.6	0	—
Other Metals & Compounds	13	2.2	6	1.3	12	9.0
Dust, Organic	12	2.0	0	—	12	9.0
Dermatitis Producers, NOC	6	1.0	0	—	6	4.5
Sulfur Dioxide	5	0.8	4	0.9	1	0.8

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 20a

MINES - EXPOSURES TO SPECIFIED MATERIALS

MATERIALS	Number of Workers Exposed to Material	Number and Percentage of Total Exposures to Specified Material in Each Industrial Subdivision			
		Bituminous Coal		Gypsum	
		No.	%	No.	%
Other Gases	470	424	90.3	46	9.7
Dust, Coal Bituminous	434	433	99.8	1	0.2
Excess Humidity	416	416	100.0	0	—
Dust, Silicate	215	210	97.7	5	2.3
Sulfur & Alkaline Sulfides	212	212	100.0	0	—
Dust, Non-siliceous	127	0	—	127	100.0
Carbon Monoxide	63	17	27.0	46	73.0
Dust, Siliceous	40	40	100.0	0	—
Other Metals & Compounds	18	6	33.3	12	66.7
Dust, Organic	12	0	—	12	100.0
Dermatitis Producers, NOC	6	0	—	6	100.0
Sulfur Dioxide	5	4	80.0	1	20.0

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 20b

PERCENT OF WORKERS IN MINING INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Percent of Exposed Workers Having Indicated Control

MATERIALS	Total Number of Ex- posures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	2015	81.2	2.0	1.6	---	0.6	---	---	---	0.2	8.6
Other Gases	470	88.5	1.7	0.4	---	---	---	---	---	---	8.1
Dust, Coal, Bituminous	434	82.8	1.8	0.2	---	1.8	---	---	---	---	7.8
Excess Humidity	416	89.7	1.7	---	---	---	---	---	---	---	8.2
Dust, Silicate	215	81.4	3.7	---	---	2.3	---	---	---	---	15.8
Sulfur & Alkaline Sulfides	212	100.0	---	---	---	---	---	---	---	---	---
Dust, Non-siliceous	127	35.3	---	18.5	---	---	---	---	---	---	---
Carbon Monoxide	63	77.8	1.6	4.8	---	---	---	---	---	---	11.1
Dust, Siliceous	40	12.5	20.0	---	---	---	---	---	---	---	67.5
Other Metals & Compounds	18	---	---	11.1	---	---	---	---	---	16.7	---
Dust, Organic	12	---	---	---	---	---	---	---	---	---	---
Dermatitis Producers, NOC	6	---	---	---	---	---	---	---	---	---	---
Sulfur Dioxide	5	---	---	40.0	---	---	---	---	---	---	---

"Other Methods" includes self-rescuer or natural ventilation

Dash (---) Indicates less than 0.1%.

NOC - Not otherwise classified.

Chemical and Allied

This industry is divided into five subclassifications and the data on exposures for each are presented in Tables 21 and 21a. The first table shows the number of workers exposed to each material and the percentage exposed of the total number surveyed in the whole industry and in each subdivision. Table 21a shows the total number of workers exposed in the entire industry and the percentage of that total in each subdivision. It will be noted at a glance that this industry had the most varied exposures, many of them being to the chemical elements and compounds.

The number of exposures to alkaline compounds heads the list, 55.2% being in the soap manufacturing group. Other chemical industries which includes compounding of insecticides, pharmaceuticals, stock and poultry remedies, inks, carbides, and perfumes also had a high exposure to alkaline compounds. The exposure to gases such as carbon monoxide, sulfur dioxide, and others, naturally was highest in the artificial gas manufacturing plants. The exposure to sulfur and compounds was highest in the explosives and fireworks group, 71.8% of all persons exposed being in that group. The exposures to siliceous dust were low in all classes of this industry, the highest rate being 1.1%.

Table 21b shows the control measures provided in this industry. Local exhaust was the most prevalent type of ventilation particularly for inorganic dusts. It will be noted that respirators were also provided for protection against some of the more harmful materials such as siliceous dust, paint and enamel, and lead.

Dash (—) indicates less than 0.1%
NOC - Not otherwise classified.

TABLE 21

CHEMICAL AND ALLIED - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to the Specified Material in Each Industrial Subdivision

Materials	All Chemical & Allied Plants		Explosives & Fireworks		Gas Works		Paint & Varnish		Soap		Other Chemical Industries	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
NUMBER OF WORKERS SURVEYED	844		79		107		15		170		473	
Alkaline Compounds	237	28.1	1	1.5	9	8.4	0	—	131	77.0	96	20.3
Other Gases	152	18.0	3	3.8	68	63.5	4	26.7	9	5.3	68	14.4
Other Metals & Compounds	104	12.3	6	7.6	35	32.7	4	26.7	4	2.4	55	11.6
Dust, Organic	96	11.4	49	62.0	2	1.9	4	26.7	9	5.3	32	6.8
Dust, Coal, Bituminous	83	5.2	28	5.1	46	43.0	0	—	4	2.4	5	1.1
oils, Fats & Waxes	74	8.8	0	—	0	—	11	73.3	30	17.6	33	7.0
Chemicals, Inorganic, NOC	68	8.1	43	54.5	0	—	9	60.0	0	—	16	3.4
Carbon Monoxide	66	7.8	3	3.8	53	49.6	0	—	4	2.4	6	1.3
Excess Heat	49	5.8	0	—	13	12.1	1	6.7	0	—	35	7.4
Sulfur & Compounds	46	5.5	33	41.8	9	8.4	0	—	0	—	4	0.8
Sulfur Dioxide	44	5.2	3	3.8	32	29.9	0	—	4	2.4	5	1.1
Coal Tar Products	42	5.0	2	2.5	17	15.9	0	—	14	8.2	9	1.9
Chemicals, Organic, NOC	38	4.5	0	—	0	—	2	13.3	21	12.4	15	3.2
Medicinals	38	4.5	0	—	0	—	0	—	0	—	38	8.0
Dust, Non-siliceous	33	3.9	0	—	0	—	5	33.3	0	—	28	5.9
Dust, Silicate	32	3.8	0	—	1	0.9	1	6.7	18	10.6	12	2.5
Petroleum Products	31	3.7	9	11.4	2	1.9	7	46.6	4	2.4	9	1.9
Dust, Coal, Anthracite	30	3.6	0	—	0	—	0	—	0	—	30	6.3
Infectious Materials	30	3.6	0	—	0	—	0	—	0	—	30	6.3
Acids & Compounds	23	2.7	0	—	0	—	6	40.0	0	—	17	3.6
Arthritis Producers, NOC	21	2.5	10	12.7	2	1.9	1	6.7	0	—	8	1.7
Hydrogen Sulfide	20	2.4	0	—	20	18.7	0	—	0	—	0	—
Alcohols, Esters & Ethers	19	2.3	0	—	0	—	0	—	5	2.9	14	3.0
Organic Solvents, NOC	19	2.3	1	1.3	1	0.9	1	6.7	5	2.9	11	2.3
Analytical Chemicals	16	1.9	6	7.6	0	—	0	—	6	3.5	4	0.8
Paints	16	1.9	0	—	0	—	0	—	0	—	16	3.4
Paint & Enamel	14	1.7	1	1.3	1	0.9	9	60.0	0	—	3	0.6
Plaster	9	1.1	0	—	0	—	0	—	5	2.9	4	0.8
Dust, Siliceous	5	0.6	0	—	0	—	0	—	0	—	5	1.1
Dust, Asbestos	3	0.4	0	—	0	—	3	20.0	0	—	0	—
Acquer & Varnish	3	0.4	0	—	0	—	1	6.7	0	—	2	0.4
Acids, Mineral	2	0.2	0	—	1	0.9	0	—	0	—	1	0.2
Acids, Organic	2	0.2	0	—	0	—	0	—	0	—	2	0.4
Fluorine & Compounds	2	0.2	0	—	0	—	0	—	0	—	2	0.4
Halogenated Hydrocarbons	2	0.2	0	—	0	—	0	—	0	—	2	0.4

Dash (—) indicates less than 0.1%

NOC - Not otherwise classified.

TABLE 21a

CHEMICAL AND ALLIED - EXPOSURES TO SPECIFIED MATERIALS

Number of
Workers
Exposed to
Specified
MaterialsNumber and Percentage of Total Exposures For
Materials in Each Industrial Subdivision

Materials	All Chemical & Allied Industries	Explosives & Fireworks		Gas Works		Paint & Varnish		Soap		Other Chemical Industries	
		No.	%	No.	%	No.	%	No.	%	No.	%
Alkaline Compounds	237	1	0.4	9	3.8	0	—	131	55.2	96	40.6
Other Gases	152	3	2.0	68	44.8	4	2.6	9	5.8	68	44.8
Other Metals & Compounds	104	6	5.8	35	33.6	4	3.8	4	3.8	55	53.0
Dust, Organic	96	49	51.0	2	2.1	4	4.2	9	9.4	32	33.3
Dust, Coal, Bituminous	83	23	27.8	46	55.4	0	—	4	4.8	5	6.0
Oils, Fats & Waxes	74	0	—	0	—	11	14.9	30	40.6	33	44.5
Chemicals, Inorganic, NOC	68	43	63.3	0	—	9	13.2	0	—	16	23.5
Carbon Monoxide	66	3	4.5	53	80.3	0	—	4	6.1	6	9.1
Excess Heat	49	0	—	13	26.5	1	2.0	0	—	35	72.5
Sulfur & Compounds	46	33	71.8	9	19.5	0	—	0	—	4	8.7
Sulfur Dioxide	44	3	6.8	32	72.7	0	—	4	9.1	5	11.4
Coal Tar Products	42	2	4.8	17	40.5	0	—	14	33.3	9	21.4
Chemicals, Organic, NOC	38	0	—	0	—	2	5.3	21	55.2	15	39.5
Medicinals	38	0	—	0	—	0	—	0	—	38	100.0
Dust, Non-siliceous	33	0	—	0	—	5	15.1	0	—	28	84.9
Dust, Silicate	32	0	—	1	3.1	1	3.1	18	56.3	12	37.5
Petroleum Products	31	9	29.0	2	6.5	7	22.6	4	12.9	9	29.0
Dust, Coal, Anthracite	30	0	—	0	—	0	—	0	—	30	100.0
Infectious Materials	30	0	—	0	—	0	—	0	—	30	100.0
Acids & Compounds	23	0	—	0	—	6	26.1	0	—	17	73.9
Arthritis Producers, NOC	21	10	47.6	2	9.5	1	4.8	0	—	8	38.1
Hydrogen Sulfide	20	0	—	20	100.0	0	—	0	—	0	—
Alcohols, Esters & Ethers	19	0	—	0	—	0	—	5	26.3	14	73.7
Organic Solvents, NOC	19	1	5.3	1	5.3	1	5.3	5	26.3	11	57.8
Analytical Chemicals	16	6	37.5	0	—	0	—	6	37.5	4	25.0
Plastics	16	0	—	0	—	0	—	0	—	16	100.0
Paint & Enamel	14	1	7.1	1	7.1	9	64.4	0	—	3	21.4
Resins	9	0	—	0	—	0	—	5	55.6	4	44.4
Dust, Siliceous	5	0	—	0	—	0	—	0	—	5	100.0
Dust, Asbestos	3	0	—	0	—	3	100.0	0	—	0	—
Acquer & Varnish	3	0	—	0	—	1	33.3	0	—	2	66.7
Acids, Mineral	2	0	—	1	50.0	0	—	0	—	1	50.0
Acids, Organic	2	0	—	0	—	0	—	0	—	2	100.0
Fluorine & Compounds	2	0	—	0	—	0	—	0	—	2	100.0
Halogenated Hydrocarbons	2	0	—	0	—	0	—	0	—	2	100.0

Dash (—) indicates less than 0.1%
NOC - Not otherwise classified.

PERCENT OF WORKERS IN CHEMICAL AND ALLIED INDUSTRIES EXPOSED TO SPECIFIED MATERIALS

Materials	Total Number of Exposed	Percent of Workers Exposed to Specified Materials									
		Dusts		Gases		Vapors		Fumes		Other	
ALL SPECIFIED MATERIALS	144	5.2	5.31	1.5	1.3	12.0	9.2	4.3	2.5	—	—
Alkaline Compounds	23	5.1	5.7	—	5.3	12.5	—	4.8	5.1	—	—
Other Gases	15	5.2	5.35	0.7	—	2.9	7.11	—	5.1	—	10.
Other Metals & Compounds	10	—	—	—	—	2.9	—	—	—	—	—
Dust, Organic	9	—	5.31	2.0	—	4.3	—	11.5	2.5	—	—
Dust, Coal, Bituminous	8	—	5.32	—	—	2.1	—	12.3	2.5	—	—
Oils, Fats & Waxes	7	—	1.3	2.4	—	4.1	—	12.3	7.3	—	—
Chemicals, Inorganic, NOC	6	—	5.02	—	—	2.3	—	14.3	2.3	—	—
Carbon Monoxide	6	7.4	0.12	—	—	4.3	0.75	—	—	—	12.
Excess Heat	4	22.7	2.93	—	—	—	—	—	—	—	—
Sulfur & Compounds	4	22.7	2.93	—	9.01	—	0.02	0.3	7.0	—	—
Sulfur Dioxide	4	22.4	7.32	—	—	6.3	0.32	—	—	—	—
Coal Tar Products	4	22.3	2.3	—	—	—	—	22.3	2.3	—	—
Chemicals, Organic, NOC	3	—	5.3	—	—	5.3	—	22.3	0.7	—	—
Medicinals	3	—	—	—	—	—	—	—	2.3	—	—
Dust, Non-Siliceous	3	22.4	2.35	—	0.87	5.3	—	—	—	—	—
Dust, Silicate	3	—	—	12.3	—	—	—	21.3	7.3	—	—
Petroleum Products	3	—	—	12.3	—	—	—	—	0.3	—	—
Dust, Coal, Anthracite	3	—	—	—	—	21.7	—	—	—	—	—
Infectious Materials	3	—	—	—	0.02	5.3	—	—	—	—	—
Lead & Compounds	2	—	5.3	—	—	12.3	—	—	2.74	—	—
Dermatitis Producers, NOC	2	—	—	4.3	—	5.3	—	—	—	—	—
Hydrogen Sulfide	2	22.3	0.01	—	—	—	0.31	—	—	—	—
Alcohols, Esters & Ethers	1	—	5.3	—	—	—	—	—	—	—	—
Organic Solvents, NOC	1	—	5.3	0.3	—	21.3	—	—	0.32	—	—
Analytical Chemicals	1	—	—	—	—	—	—	—	—	—	—
Inks	1	—	—	—	—	—	—	—	—	—	—
Paint & Enamel	1	—	—	—	—	14.3	—	—	5.32	—	—
Dyes	1	—	—	—	—	—	—	—	—	—	—
Dust, Siliceous	1	—	—	—	—	60.0	—	—	0.32	—	—
Dust, Asbestos	1	—	—	—	—	—	—	—	—	—	—
Lacquer & Varnish	1	—	—	—	—	100.0	—	—	—	—	—
Acids, Mineral	1	—	—	—	—	20.0	—	—	—	—	—
Acids, Organic	1	—	—	—	0.02	—	—	—	—	—	—
Fluorine & Compounds	1	—	—	—	—	—	—	—	0.02	—	—
Halogenated Hydrocarbons	1	—	0.02	20.0	—	—	—	—	—	—	—

— indicates less than 0.1%.

"Other" includes outside work, quantitative, qualitative gas indicator, unclassified, and other as noted on total listing page.

— indicates classified.

TABLE 21b

PERCENT OF WORKERS IN CHEMICAL AND ALLIED INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Materials	Total Number of Exposures	Ventilation		Percent of Workers Having Indicated Control							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	1445	5.6	1.0	12.0	6.5	---	2.4	3.6	5.9	4.1	16.3
Alkaline Compounds	237	5.1	---	18.5	4.2	---	---	1.3	---	6.3	7.6
Other Gases	152	9.2	0.7	2.9	---	---	10.5	1.3	21.7	---	36.2
Other Metals & Compounds	104	---	---	2.9	---	---	---	---	---	---	---
Dust, Organic	96	---	1.0	4.2	11.5	---	---	---	---	---	---
Dust, Coal, Bituminous	83	---	---	3.6	13.3	---	---	5.2	---	---	14.6
Oils, Fats & Waxes	74	---	1.4	4.1	13.5	---	---	3.6	---	---	26.5
Chemicals, Inorganic, NOC	68	---	---	2.9	16.2	---	---	2.7	---	---	8.1
Carbon Monoxide	66	7.6	---	4.5	---	---	---	4.4	---	---	20.6
Excess Heat	49	36.7	---	---	---	---	23.8	---	47.0	---	41.0
Sulfur & Compounds	46	10.9	---	---	23.8	---	---	---	---	---	59.2
Sulfur Dioxide	44	11.4	---	6.8	---	---	---	8.7	10.9	10.9	39.2
Coal Tar Products	42	11.9	---	---	23.8	---	---	---	25.0	---	22.7
Chemicals, Organic, NOC	38	---	---	5.3	26.3	---	---	2.4	---	---	2.4
Medicinals	38	---	---	---	---	---	---	7.9	---	---	2.6
Dust, Non-Siliceous	33	36.4	---	36.4	---	---	---	2.6	---	---	---
Dust, Silicate	32	---	12.5	---	31.2	---	---	---	---	72.8	36.4
Petroleum Products	31	---	12.9	---	---	---	---	18.7	---	---	---
Dust, Coal, Anthracite	30	---	---	86.7	---	---	---	6.5	---	---	---
Infectious Materials	30	---	---	13.8	---	---	---	---	---	---	---
Lead & Compounds	23	---	---	13.0	---	---	---	---	---	50.0	---
Dermatitis Producers, NOC	21	---	4.8	9.5	---	---	---	17.4	---	---	4.3
Hydrogen Sulfide	20	25.0	---	---	---	---	---	---	---	---	---
Alcohols, Esters & Ethers	19	---	---	---	---	---	---	---	25.0	---	20.0
Organic Solvents, NOC	19	---	5.3	31.6	---	---	---	---	---	---	5.3
Analytical Chemicals	16	---	---	---	---	---	---	21.0	---	---	5.3
Inks	16	---	---	---	---	---	---	---	---	---	---
Paint & Enamel	14	---	---	14.3	---	---	---	---	---	---	---
Dyes	9	---	---	---	---	---	---	42.8	---	---	---
Dust, Siliceous	5	---	---	60.0	---	---	---	---	---	---	---
Dust, Asbestos	5	---	---	---	---	---	---	20.0	---	---	---
Lacquer & Varnish	3	---	---	100.0	---	---	---	---	---	---	---
Acids, Mineral	2	---	---	50.0	---	---	---	---	---	---	---
Acids, Organic	2	---	---	---	---	---	---	---	---	---	---
Fluorine & Compounds	2	---	---	---	---	---	---	---	---	50.0	---
Halogenated Hydrocarbons	2	---	50.0	---	---	---	---	100.0	---	---	50.0

Dash (—) indicates less than 0.1%.

"Other Methods" includes outside work, remote control, open windows, combustible gas indicator, unsealed room or open dock, automatic heat control on metal melting pot.

NOC - Not otherwise classified.

Cigar and Tobacco

Experiences in eastern tobacco factories revealed the exposure to siliceous dust in this industry which apparently came from the soil clinging to the tobacco leaves. Hence, the reason for this class of industry being covered by the survey. However, only one plant in this class was visited because other plants which had been selected for a survey had either gone out of business or had ceased manufacturing cigars and were merely operating as wholesalers.

Table 22 shows the two workers in the cigar factory visited were exposed to organic dust, being of course in the form of tobacco.

Clay, Glass, and Stone TABLE 22

CIGAR AND TOBACCO - EXPOSURES TO SPECIFIED MATERIALS

Materials

**Number and Percentage of Workers
Exposed to Specified Materials**

Cigar Manufacture

NUMBER OF WORKERS SURVEYED

2

No.

%

Dust, Organic

2

100.0

Clay, Glass, and Stone

Tables 23 and 23a shows the exposures in the clay, glass, and stone industry which is subdivided into brick and tile plants; glass processing plants; lime, cement, and artificial stone (concrete blocks) plants, and marble and stone yards which include monument works. As one would expect, the exposures to dusts were the heaviest in all classes of this industry. Before entering into a discussion of the exposures, it should be explained that a preliminary petrographic analysis on several samples of the material used in brick and tile manufacture indicated the free silica content to range from less than 1% to 4%. Hence, exposures to siliceous dust were given to workers in this branch of the industry who were associated with dry processing. Exposures to siliceous dust were not given to workers handling or processing the clay after it had been wetted or burned except where dry dust was associated with the process. Table 23 shows the exposures to the various materials for the industry as a whole and for the separate subdivisions. For example, 57.1% of all workers surveyed were exposed to silicate dusts but 86.5% of the workers in brick and tile plants and 45.1% of the workers in lime and cement plants were exposed to this type of dust. The table also shows that the highest percentage of exposures to siliceous and non-siliceous dusts occurred in the marble and stone cutting plants.

The exposures to carbon monoxide, other gases, and other materials all numbered less than 10% for the industry as a whole.

An interesting fact brought out by this table is the number of workers exposed to organic solvents and to lead compounds in the glass industry. These exposures were associated with decorative and other processing of glass materials.

Table 23a shows the distribution of exposures among the various subdivisions. For example 48.8% of the exposures to silicate dust occurred in the brick and tile plants and 49.1% occurred in the lime and cement plants. The highest number of exposures to siliceous dusts were contributed by the brick and tile plants whereas the highest number to non-siliceous dusts were contributed by the lime and cement plants as would be expected.

The data on control measures as found in the plants surveyed are presented in Table 23b. It can be seen at a glance that the only type of ventilation system encountered for dust control was local exhaust. The number of workers provided with this type system, however, was quite low. Wet methods were employed to some extent as indicated by 24.9% of the workers provided with this type of control for siliceous dust, 16% for the control of silicate dust, and 15.1% for the control of non-siliceous dust. It will also be noted that very few of the workers were provided with respirators. Under "other methods" are classified those operations which were carried on outside of any building where atmospheric air currents tend to dilute and carry away the dust, gas, or vapor clouds. As can be seen from the table, a relatively large percentage of the workers are classified as having this type of control. Whether it is adequate for protection can only be determined by detailed studies of the process.

TABLE 23

CLAY, GLASS, AND STONE - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to
Specified Material in Each Industrial Subdivision

Materials	All Plants		Brick & Tile		Glass		Lime & Cement		Marble & Stone	
NUMBER OF WORKERS SURVEYED	1771		561		44		1119		47	
	No.	%	No.	%	No.	%	No.	%	No.	%
Dust, Silicate	1011	57.1	486	86.5	13	29.5	504	45.1	8	17.0
Dust, Siliceous	329	18.5	151	26.9	4	9.1	130	11.6	44	93.7
Dust, Non-siliceous	232	13.1	4	0.7	13	29.5	184	16.5	31	67.0
Dust, Coal, Bituminous	170	9.6	55	9.8	1	2.3	113	10.2	1	2.1
Carbon Monoxide	144	8.1	55	9.8	3	6.8	84	7.5	2	4.3
Other Gases	87	4.9	47	8.4	3	6.8	36	3.2	1	2.1
Other Metals & Compounds	85	4.8	41	7.3	3	6.8	41	3.7	0	—
Petroleum Products	85	4.8	4	0.7	0	—	81	7.2	0	—
Sulfur Dioxide	59	3.3	26	4.6	0	—	32	2.9	1	2.1
Dermatitis Producers, NOC	45	2.5	3	0.5	0	—	41	3.7	1	2.1
Chemicals, Inorganic, NOC	31	1.8	29	5.2	2	4.5	0	—	0	—
Analytical Chemicals	26	1.5	0	—	0	—	26	2.3	0	—
Excess Heat	17	1.0	0	—	0	—	0	—	17	1.5
Dust, Organic	14	0.8	4	0.7	2	4.5	8	0.7	0	—
Hydrogen Sulfide	12	0.7	0	—	0	—	12	1.1	0	—
Alkaline Compounds	11	0.6	11	1.9	0	—	0	—	0	—
Organic Solvents, NOC	8	0.5	2	0.4	6	13.6	0	—	0	—
Laquer & Varnish	4	0.2	2	0.4	2	4.5	0	—	0	—
Lead & Compounds	4	0.2	2	0.4	2	4.5	0	—	0	—
Acids, Mineral	2	—	0	—	2	4.5	0	—	0	—
Acids, Organic	2	—	0	—	2	4.5	0	—	0	—
Paint & Enamel	2	—	2	0.4	0	—	0	—	0	—
Alcohols, Esters & Ethers	1	—	0	—	1	2.3	0	—	0	—
Chemicals, Organic, NOC	1	—	0	—	0	—	1	0.1	0	—

Dash (—) indicates less than 0.1%.
NOC - Not otherwise classified.

Dash (—) indicates less than 0.1%.
NOC - Not otherwise classified.

TABLE 23a

CLAY, GLASS, AND STONE - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision							
		Brick & Tile		Glass		Lime & Cement		Marble & Stone	
		No.	%	No.	%	No.	%	No.	%
Dust, Silicate	1011	486	48.8	13	1.3	504	49.1	8	0.8
Dust, Siliceous	329	151	45.9	4	1.2	130	39.5	44	13.4
Dust, Non-siliceous	232	4	1.7	13	5.6	134	72.3	31	13.4
Dust, Coal, Bituminous	170	55	32.4	1	0.6	113	66.4	1	0.6
Carbon Monoxide	144	55	38.2	3	2.1	84	58.3	2	1.4
Other Gases	87	47	54.0	3	3.5	36	41.4	1	1.1
Other Metals & Compounds	85	41	48.2	3	3.5	41	48.2	0	—
Petroleum Products	85	4	4.7	0	—	81	95.3	0	—
Sulfur Dioxide	59	26	44.1	0	—	32	54.2	1	1.7
Asmatitis Producers, NOC	45	3	6.7	0	—	41	91.1	1	2.2
Chemicals, Inorganic, NOC	31	29	93.5	2	6.5	0	—	0	—
Analytical Chemicals	26	0	—	0	—	26	100.0	0	—
Excess Heat	17	0	—	0	—	0	—	17	100.0
Dust, Organic	14	4	28.6	2	14.3	8	57.1	0	—
Hydrogen Sulfide	12	0	—	0	—	12	100.0	0	—
Alkaline Compounds	11	11	100.0	0	—	0	—	0	—
Organic Solvents, NOC	8	2	25.0	6	75.0	0	—	0	—
Lacquer & Varnish	4	2	50.0	2	50.0	0	—	0	—
Acids, Mineral	2	0	—	2	100.0	0	—	0	—
Acids, Organic	2	0	—	2	100.0	0	—	0	—
Paint & Enamel	2	2	100.0	0	—	0	—	0	—
Alcohols, Esters & Ethers	1	0	—	1	100.0	0	—	0	—
Chemicals, Organic, NOC	1	0	—	0	—	1	100.0	0	—

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 23b

PERCENT OF WORKERS IN CLAY, GLASS, AND STONE INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Materials	Total Number of Exposures	Ventilation		Percent of Workers Having Indicated Control							Protective Clothing	Other Methods
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets			
ALL SPECIFIED MATERIALS	2382	---	---	8.2	1.0	11.8	---	2.4	0.7	2.5	20.6	
Dust, Silicate	1011	---	---	6.5	0.3	16.0	---	1.8	0.1	---	11.6	
Dust, Siliceous	329	---	---	8.8	4.6	24.9	---	7.6	2.7	4.0	21.0	
Dust, Non-siliceous	232	---	---	9.5	0.9	15.1	---	---	2.6	3.9	33.6	
Dust, Coal, Bituminous	170	---	---	7.1	---	---	---	---	---	---	53.5	
Carbon Monoxide	144	---	---	10.4	2.8	---	---	---	---	---	18.0	
Other Gases	87	---	---	11.5	---	---	---	---	---	---	50.6	
Other Metals & Compounds	85	---	---	17.7	---	---	---	1.2	---	15.3	17.7	
Sulfur Dioxide	59	---	---	23.7	---	---	---	---	---	---	20.3	
Dermatitis Producers, NOC	45	---	---	---	---	---	---	---	---	---	---	
Chemicals, Inorganic, NOC	31	---	---	---	---	---	---	---	---	---	100.0	
Analytical Chemicals	26	---	---	---	---	---	---	---	---	---	---	
Excess Heat	17	---	---	---	---	---	---	---	---	---	---	
Dust, Organic	14	---	---	---	---	---	---	---	---	---	23.5	
Hydrogen Sulfide	12	---	---	---	---	---	---	---	---	85.7	---	
Alkaline Compounds	11	---	---	---	---	---	---	---	---	---	---	
Organic Solvents, NOC	8	---	---	---	---	9.1	---	---	---	---	---	
Lacquer & Varnish	4	---	---	50.0	---	---	---	37.5	---	---	---	
Lead & Compounds	4	---	---	100.0	---	---	---	75.0	---	---	---	
Acids, Mineral	2	---	---	50.0	---	---	---	50.0	---	---	---	
Acids, Organic	2	---	50.0	---	---	---	---	50.0	---	50.0	---	
Paint & Enamel	2	---	---	---	---	---	---	---	---	---	---	
Alcohols, Esters & Ethers	1	---	---	100.0	---	---	---	100.0	---	---	---	
Chemicals, Organic, NOC	1	---	---	100.0	---	---	---	100.0	---	---	---	

Dash (--) indicates less than 0.1%.
 "Other Methods" includes outside work.
 NOC - Not otherwise classified.

PERCENT OF WORKERS IN

Materials

ALL SPECIFIED MATERIALS

Dust, Silicate	100	-0.08	-0.2	0.2	9.0	1.0	0.2	10.0	—
Dust, Siliceous	100	-0.11	—	0.0	1.0	0.0	0.1	10.0	—
Dust, Non-siliceous	100	-0.12	-0.2	0.0	9.0	0.0	0.7	10.0	—
Dust, Coal, Bituminous	100	-0.02	-0.2	0.0	0.0	0.0	—	10.1	—
Carbon Monoxide	100	-0.03	—	7.1	—	—	—	—	—
Other Gases	100	-0.01	—	10.0	—	0.0	—	—	—
Other Metals & Compounds	100	-0.00	—	10.0	—	—	—	—	—
Sulfur Dioxide	100	-0.01	-0.01	10.0	—	—	0.1	—	—
Dermatitis Producers, NOC	100	-0.00	—	10.0	—	—	—	—	—
Chemicals, Inorganic, NOC	100	-0.001	—	—	—	—	—	—	—
Analytical Chemicals	100	—	—	—	—	—	—	—	—
Excess Heat	100	-0.00	—	—	—	—	—	—	—
Dust, Organic	100	—	-0.00	—	—	—	—	—	—
Hydrogen Sulfide	100	—	—	—	—	—	—	—	—
Alkaline Compounds	100	—	—	—	—	—	—	—	—
Organic Solvents, NOC	100	—	—	10.0	—	—	0.00	—	—
Lacquer & Varnish	100	—	—	100.0	—	—	0.00	—	—
Lead & Compounds	100	—	—	10.0	—	—	0.00	—	—
Acids, Mineral	100	—	10.00.00	—	—	—	0.00	—	—
Acids, Organic	100	—	—	—	—	—	—	—	—
Paint & Enamel	100	—	—	100.0	—	—	0.001	—	—
Alcohols, Esters & Ethers	100	—	—	100.0	—	—	0.001	—	—
Chemicals, Organic, NOC	100	—	—	—	—	—	—	—	—

Each (—) indicates less than 0.1%.
 "Other Methods" includes methods used.
 NOC - Not otherwise classified.

Clothing Industry

The clothing industry in Iowa is practically all concerned with the manufacture of shirts, overalls, and gloves. Consequently, the processing is chiefly cutting and sewing and, as indicated by Tables 24 and 24a, by far the greatest number of exposures were to organic dust which comes from the cloth under processing. Exposures to other materials were minor in character and did not include a large percentage of the workers.

No control measures were recorded for the exposures in

this industry.

Exposure	Number of Workers	Organic Dust	Inorganic Dust	Other	Total
Shirts	7	0.9	0	0	0.9
Overalls	3	0.5	0	0	0.5
Gloves	4	0.5	0	0	0.5
Machine Sewing	5	0.4	0	0	0.4
Hand Sewing	2	0.3	0	0	0.3
Machine Sewing, Gloves	1	0.1	0	0	0.1
Hand Sewing, Gloves	1	0.1	0	0	0.1

Note: (--) indicates less than 0.1%.
NOC - Not otherwise classified.

TABLE 24

CLOTHING - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to Specified
Materials in Each Industrial Subdivision

Materials	All Plants		Glove Factories		Other Clothing	
NUMBER OF WORKERS SURVEYED	765		325		440	
	No.	%	No.	%	No.	%
Dust, Organic	643	84.8	325	100.0	323	73.4
Inks	7	0.9	5	1.5	2	0.5
Dyes	5	0.6	0	--	5	1.1
Organic Solvents, NOC	4	0.5	0	--	4	0.9
Excess Humidity	3	0.4	0	--	3	0.7
Dust, Silicate	2	0.3	0	--	2	0.5
Chemicals, Organic, NOC	1	0.1	0	--	1	0.2
Other Metals & Compounds	1	0.1	0	--	1	0.2

Dash (--) indicates less than 0.1%.
NOC - Not otherwise classified.

TABLE 24a

CLOTHING - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to Specified Materials in Each Industrial Subdivision			
		Glove Factories		Other Clothing	
		No.	%	No.	%
Dust, Organic	648	325	50.1	323	49.9
Inks	7	5	71.4	2	28.6
Dyes	5	0	—	5	100.0
Organic Solvents, NOC	4	0	—	4	100.0
Excess Humidity	3	0	—	3	100.0
Dust, Silicate	2	0	—	2	100.0
Chemicals, Organic, NOC	1	0	—	1	100.0
Other Metals & Compounds	1	0	—	1	100.0

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

Food and Allied

Ordinarily the health problem in the food industry is regarded as one concerning the methods of handling, which affect the sanitary quality of the food put on the market. This problem is, of course, a major one from the standpoint of public health. On the other hand, the methods of processing foods introduce another health problem which concerns itself with the employees. As indicated by Tables 25 and 25a, workers in the food and allied industry were exposed to many materials, some of which may have a detrimental effect upon their health. Table 25 shows that the greatest number of workers surveyed were exposed to organic dust. Second on the list are exposures to various materials classed as dermatitis producers, such as chocolate, starch, and sugar, which numbers 7.6% of all workers surveyed. Without going into a lengthy discussion on the causes of dermatitis, it should be explained that many persons are allergic to some substance or another. Hence, a material producing a skin reaction in one person may not affect others. On the other hand, there are some materials which, even though used as an ingredient of processed foods, are known to cause a skin reaction in a great many persons when contacted in relatively large quantities. These materials are classed as dermatitis producers. Bakeries with 48.5% of the workers exposed, candy plants with 49.2%, and corn products plants with 21.8%, offer the greatest number of exposures to this type of material.

The exposure to infectious materials is one which rarely

occurs in other classes of industry. These materials are often responsible for certain infectious diseases such as undulant fever (brucellosis), anthrax and tularemia. A total of 4.8% of all workers were exposed to this class of material and as would be expected all occurred in the slaughter and meat packing division, which has an exposure rate of 8.8%.

The exposure to carbon monoxide was relatively low in this industry. The high rate of 32.6% in the liquor and beverage division may be accounted for by the fact that all truck drivers were given this exposure and a high percentage of the workers in these plants were so occupied.

Table 25a shows the distribution of the exposures according to the subdivision. For example, of the 1,238 exposures to organic dust, 2.7% occurred in bakeries, 0.4% in milk product plants, 4.2% in candy plants, 11.5% in flour and feed mills, 0.2% in canning and preserving, 7.1% in slaughter and meat packing plants, 50.6% in corn products plants, 42.4% in other food processing plants and 1.1% in liquor and beverage plants.

In regard to dermatitis producers this table shows that only 7.4% of the total exposures were encountered in bakeries, although Table 25 shows 48.5% of the workers in bakeries having this exposure.

Thus Table 25 shows the proportion of total workers in each subdivision exposed to the various materials; whereas Table 25a shows the proportion of the total number of workers exposed to

the materials.

As shown by Table 25b, local exhaust ventilation was the most prevalent in this industry, 15.5% of all exposed workers having this type of control. Insofar as exposures to dermatitis producers are concerned, it will be noted that practically the only control measure employed was exhaust ventilation and that none of the workers surveyed wore protective clothing. It should be mentioned, however, that in this industry many workers were provided with aprons, coats, caps, etc. which aid in maintaining sanitary handling of the foods and also afford some protection against dermatitis producers or infectious materials. Likewise, and particularly in the meat packing industry, special clothing such as shoes and finger or hand shields were provided for protection against accidental injury, which might also be of some protection to the health of the worker. These types of clothing, however, were not recorded since their primary purpose was for other than health protection.

TABLE 25

FOOD AND ALLIED - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to Specified Materials in Each Industrial Subdivision

Materials	All Plants		Bakeries		Milk Products		Candy		Flour & Feed Mills		Canning & Preserving		Slaughter & Packing		Corn Products		Other Foods		Liquor & Beverages	
NUMBER OF WORKERS SURVEYED	5900		68		106		209		200		146		3208		977		833		148	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Dust, Organic	1238	20.9	33	48.5	4	3.8	52	24.9	140	70.0	2	1.4	88	2.7	373	38.7	523	63.1	13	8.8
Dermatitis Producers, NOC	447	7.6	33	48.5	5	4.7	103	49.2	5	2.5	3	2.1	66	2.1	213	21.8	13	1.5	6	4.1
Other Metals & Compounds	409	6.9	0	—	1	1.0	0	—	21	10.5	0	—	218	6.8	124	12.7	45	5.4	0	—
Oils, Fats & Waxes	290	4.9	33	48.5	22	20.8	50	23.9	8	4.0	0	—	145	4.5	25	2.6	6	0.7	1	0.7
Infectious Materials	281	4.8	0	—	0	—	0	—	0	—	0	—	231	8.8	0	—	0	—	0	—
Carbon Monoxide	206	3.5	12	17.6	16	15.1	14	6.7	0	—	1	0.7	58	1.8	41	4.2	16	1.9	48	32.6
Excess Heat	186	3.2	11	16.2	0	—	0	—	0	—	0	—	150	4.7	0	—	25	3.0	0	—
Excess Humidity	166	2.8	11	16.2	0	—	0	—	0	—	0	—	155	4.8	0	—	0	—	0	—
Other Gases	154	2.6	0	—	11	10.4	6	2.9	4	2.0	1	0.7	37	1.2	53	5.4	16	1.9	26	17.6
Sulfur Dioxide	107	1.8	0	—	0	—	6	2.9	0	—	1	0.7	8	0.2	87	8.9	5	0.6	0	—
Petroleum Products	100	1.7	0	—	1	1.0	0	—	5	2.5	0	—	66	2.1	18	1.8	4	0.5	6	4.1
Alkaline Compounds	97	1.6	0	—	19	17.9	0	—	1	0.5	2	1.4	44	1.4	21	2.2	0	—	10	6.8
Dust, Silicate	72	1.2	1	1.5	2	1.9	0	—	0	—	1	0.7	55	1.7	12	1.2	0	—	0	—
Chemicals, Inorganic, NOC	63	1.1	0	—	0	—	0	—	5	2.5	17	11.6	25	0.8	14	1.4	0	—	2	1.4
Acids, Mineral	49	0.8	0	—	13	12.8	0	—	2	1.0	0	—	1	—	27	2.8	6	0.7	0	—
Dust, Coal, Bituminous	47	0.8	0	—	1	1.0	6	2.9	0	—	1	0.7	10	0.3	24	2.5	5	0.6	0	—
Analytical Chemicals	36	0.6	0	—	0	—	0	—	0	—	0	—	0	—	23	2.4	13	1.5	0	—
Chemicals, Organic, NOC	27	0.5	0	—	0	—	0	—	4	2.0	0	—	0	—	6	0.6	10	1.2	7	4.7
Organic Solvents, NOC	26	0.4	0	—	0	—	0	—	0	—	0	—	8	0.2	12	1.2	6	0.7	0	—
Dust, Non-siliceous	19	0.3	0	—	0	—	1	0.5	18	9.0	0	—	0	—	0	—	0	—	0	—
Inks	17	0.3	0	—	0	—	0	—	0	—	0	—	6	0.2	10	1.0	1	0.1	0	—
Acids, Organic	16	0.3	0	—	0	—	0	—	1	0.5	0	—	0	—	2	0.2	5	0.6	8	5.4
Sulfur & Compounds	13	0.2	0	—	0	—	0	—	10	5.0	0	—	0	—	3	0.3	0	—	0	—
Paint & Enamel	10	0.2	0	—	0	—	0	—	0	—	0	—	5	0.2	0	—	5	0.6	0	—
Dust, Siliceous	8	0.1	0	—	0	—	0	—	0	—	0	—	0	—	6	0.6	2	0.2	0	—
Lead & Compounds	7	0.1	0	—	0	—	0	—	0	—	0	—	1	—	1	0.1	5	0.6	0	—
Lacquer & Varnish	5	0.1	0	—	0	—	0	—	0	—	0	—	5	0.2	0	—	0	—	0	—
Alcohols, Esters & Ethers	2	—	0	—	0	—	0	—	0	—	0	—	0	—	0	—	1	0.1	1	0.7
Dyes	2	—	0	—	0	—	0	—	2	1.0	0	—	0	—	0	—	0	—	0	—
Fluorine & Compounds	2	—	0	—	0	—	0	—	0	—	0	—	0	—	0	—	0	—	0	—
Halogenated Hydrocarbons	1	—	1	1.5	0	—	0	—	0	—	0	—	0	—	0	—	0	—	0	—

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

Materials

Dust, Organic
 Dermatitis Producers, NOC
 Other Metals & Compounds
 Oils, Fats & Waxes
 Infectious Materials
 Carbon Monoxide
 Excess Heat
 Excess Humidity
 Other Gases
 Sulfur Dioxide
 Petroleum Products
 Alkaline Compounds
 Dust, Silicate
 Chemicals, Inorganic, NOC
 Acids, Mineral
 Dust, Coal, Bituminous
 Analytical Chemicals
 Chemicals, Organic, NOC
 Organic Solvents, NOC
 Dust, Non-siliceous
 Inks
 Acids, Organic
 Sulfur & Compounds
 Paint & Enamel
 Dust, Siliceous
 Lead & Compounds
 Lacquer & Varnish
 Alcohols, Esters & Ethers
 Dyes
 Fluorine & Compounds
 Halogenated Hydrocarbons

Under this heading are listed all materials which are classified as hazardous materials. The classification is based on the results of tests conducted in accordance with the methods specified in the following table.

Material	Test	Result	Classification
Dust, Organic	10001.1	0.1	0.1
Dermatitis Producers, NOC	10002.1	0.1	0.1
Other Metals & Compounds	10003.1	0.1	0.1
Oils, Fats & Waxes	10004.1	0.1	0.1
Infectious Materials	10005.1	0.1	0.1
Carbon Monoxide	10006.1	0.1	0.1
Excess Heat	10007.1	0.1	0.1
Excess Humidity	10008.1	0.1	0.1
Other Gases	10009.1	0.1	0.1
Sulfur Dioxide	10010.1	0.1	0.1
Petroleum Products	10011.1	0.1	0.1
Alkaline Compounds	10012.1	0.1	0.1
Dust, Silicate	10013.1	0.1	0.1
Chemicals, Inorganic, NOC	10014.1	0.1	0.1
Acids, Mineral	10015.1	0.1	0.1
Dust, Coal, Bituminous	10016.1	0.1	0.1
Analytical Chemicals	10017.1	0.1	0.1
Chemicals, Organic, NOC	10018.1	0.1	0.1
Organic Solvents, NOC	10019.1	0.1	0.1
Dust, Non-siliceous	10020.1	0.1	0.1
Inks	10021.1	0.1	0.1
Acids, Organic	10022.1	0.1	0.1
Sulfur & Compounds	10023.1	0.1	0.1
Paint & Enamel	10024.1	0.1	0.1
Dust, Siliceous	10025.1	0.1	0.1
Lead & Compounds	10026.1	0.1	0.1
Lacquer & Varnish	10027.1	0.1	0.1
Alcohols, Esters & Ethers	10028.1	0.1	0.1
Dyes	10029.1	0.1	0.1
Fluorine & Compounds	10030.1	0.1	0.1
Halogenated Hydrocarbons	10031.1	0.1	0.1

Note: (—) indicates hazardous material.
 NOC = Not otherwise classified.

TABLE 25a

FOOD AND ALLIED - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision																	
		Bakeries		Milk Products		Candy		Flour & Feed Mills		Canning & Preserving		Slaughter & Packing		Corn Products		Other Foods		Liquor & Beverages	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Dust, Organic	1238	33	2.7	4	0.4	52	4.2	140	11.3	2	0.2	88	7.1	378	30.6	528	42.4	13	1.1
Dermatitis Producers, NOC	447	33	7.4	5	1.1	103	23.0	5	1.1	3	0.3	66	14.8	213	48.1	13	2.9	6	1.3
Other Metals & Compounds	409	0	—	1	0.2	0	—	21	5.1	0	—	218	53.4	124	30.3	45	11.0	0	—
Oils, Fats & Waxes	290	33	11.4	22	7.6	50	17.3	8	2.8	0	—	145	49.9	25	8.6	6	2.1	1	0.3
Infectious Materials	281	0	—	0	—	0	—	0	—	0	—	281	100.0	0	—	0	—	0	—
Carbon Monoxide	206	12	5.8	16	7.8	14	6.8	0	—	1	0.5	58	33.1	41	19.9	16	7.8	48	23.3
Excess Heat	186	11	5.9	0	—	0	—	0	—	0	—	150	80.7	0	—	25	13.4	0	—
Excess Humidity	166	11	6.5	0	—	0	—	0	—	0	—	155	93.5	0	—	0	—	0	—
Other Gases	154	0	—	11	7.1	6	3.9	4	2.6	1	0.6	37	24.0	53	34.5	16	10.4	26	16.9
Sulfur Dioxide	107	0	—	0	—	6	5.6	0	—	1	0.9	8	7.5	87	81.3	5	4.7	0	—
Petroleum Products	100	0	—	1	1.0	0	—	5	5.0	0	—	66	66.0	18	18.0	4	4.0	6	6.0
Alkaline Compounds	97	0	—	19	19.6	0	—	1	1.0	2	2.1	44	45.3	21	21.7	0	—	10	10.3
Dust, Silicate	72	1	1.4	2	2.8	0	—	0	—	1	1.4	55	77.7	12	16.7	0	—	0	—
Chemicals, Inorganic, NOC	63	0	—	0	—	0	—	5	7.9	17	27.0	25	39.7	14	22.2	0	—	2	3.2
Acids, Mineral	49	0	—	13	26.5	0	—	2	4.1	0	—	1	2.0	27	55.2	6	12.2	0	—
Dust, Coal, Bituminous	47	0	—	1	2.1	6	12.8	0	—	1	2.1	10	21.3	24	51.1	5	10.6	0	—
Analytical Chemicals	36	0	—	0	—	0	—	0	—	0	—	0	—	23	63.9	13	36.1	0	—
Chemicals, Organic, NOC	27	0	—	0	—	0	—	4	14.8	0	—	0	—	6	22.2	10	37.1	7	25.9
Organic Solvents, NOC	26	0	—	0	—	0	—	0	—	0	—	8	30.8	12	46.1	6	23.1	0	—
Dust, Non-siliceous	19	0	—	0	—	1	5.3	18	94.7	0	—	0	—	0	—	0	—	0	—
Inks	17	0	—	0	—	0	—	0	—	0	—	6	35.3	10	58.8	1	5.9	0	—
Acids, Organic	16	0	—	0	—	0	—	1	6.2	0	—	0	—	2	12.5	5	31.3	8	50.0
Sulfur & Compounds	13	0	—	0	—	0	—	10	75.9	0	—	0	—	3	23.1	0	—	0	—
Paint & Enamel	10	0	—	0	—	0	—	0	—	0	—	5	50.0	0	—	5	50.0	0	—
Dust, Siliceous	8	0	—	0	—	0	—	0	—	0	—	0	—	6	75.0	2	25.0	0	—
Lead & Compounds	7	0	—	0	—	0	—	0	—	0	—	1	14.3	1	14.3	5	71.4	0	—
Lacquer & Varnish	5	0	—	0	—	0	—	0	—	0	—	5	100.0	0	—	0	—	0	—
Alcohols, Esters & Ethers	2	0	—	0	—	0	—	0	—	0	—	0	—	0	—	1	50.0	1	50.0
Dyes	2	0	—	0	—	0	—	2	100.0	0	—	0	—	0	—	0	—	0	—
Fluorine & Compounds	2	0	—	0	—	0	—	0	—	0	—	2	100.0	0	—	0	—	0	—
Halogenated Hydrocarbons	1	1	100.0	0	—	0	—	0	—	0	—	0	—	0	—	0	—	0	—

Dash (—) indicates less than 0.1%.
 NOC - Not otherwise classified.

PERCENT OF WORKERS IN PO

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road along, and other

Percent of Workers Suffering from

Ventilation

satisfactory

Materials

Total
Num
of
Expe

satisfactory

ALL SPECIFIED MATERIALS

Dust, Organic
Dermatitis Producers, NOC
Other Metals & Compounds
Oils, Fats & Waxes
Infectious Materials
Carbon Monoxide
Excess Heat
Excess Humidity
Other Gases
Sulfur Dioxide
Petroleum Products
Alkaline Compounds
Dust, Silicate
Chemicals, Inorganic, NOC
Acids, Mineral
Dust, Coal, Bituminous
Analytical Chemicals
Chemicals, Organic, NOC
Organic Solvents, NOC
Dust, Non-siliceous
Inks
Acids, Organic
Sulfur & Compounds
Paint & Enamel
Dust, Siliceous
Lead & Compounds
Lacquer & Varnish
Alcohols, Esters & Ethers
Dyes
Fluorine & Compounds
Halogenated Hydrocarbons

NOC - Not otherwise classified.
Dash (-) indicates less than 0.1%.
"Other Solvents" includes acetone, benzene, gasoline, kerosene, turpentine, etc.
percent. contact with solvent vapors or
combustible gas fumes.

TABLE 25b

PERCENT OF WORKERS IN FOOD AND ALLIED INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	4102	—	0.2	15.5	1.4	—	0.5	1.6	—	1.3	0.8
Dust, Organic	1238	—	0.4	40.3	1.0	—	—	4.0	—	—	—
Dermatitis Producers, NOC	447	—	—	22.6	—	—	—	—	—	—	0.2
Other Metals & Compounds	409	—	—	—	—	—	—	0.2	—	10.5	—
Oils, Fats & Waxes	290	—	—	—	3.1	—	—	0.3	—	0.3	2.1
Infectious Materials	281	—	—	—	—	—	—	—	—	—	—
Carbon Monoxide	206	—	2.4	2.0	—	—	—	—	—	—	—
Excess Heat	186	—	—	—	—	—	—	—	—	—	—
Excess Humidity	166	—	—	—	—	—	—	—	—	—	—
Other Gases	154	—	—	3.9	—	—	14.3	—	—	—	—
Sulfur Dioxide	107	—	—	3.7	2.8	—	—	—	—	—	—
Petroleum Products	100	—	—	—	—	—	—	—	—	—	—
Alkaline Compounds	97	—	—	8.3	5.2	—	—	—	—	4.1	—
Dust, Silicate	72	—	—	—	—	—	—	—	—	—	—
Chemicals, Inorganic, NOC	63	—	—	—	—	—	—	1.6	—	—	—
Acids, Mineral	49	—	—	4.1	12.2	—	—	—	—	10.2	—
Dust, Coal, Bituminous	47	—	—	8.5	—	—	—	—	—	—	21.2
Analytical Chemicals	36	—	—	—	—	—	—	—	—	—	—
Chemicals, Organic, NOC	27	—	—	—	22.2	—	—	3.7	—	—	—
Organic Solvents, NOC	26	—	—	—	57.7	—	—	—	—	57.7	—
Dust, Non-siliceous	19	—	—	21.1	—	—	—	—	—	—	—
Inks	17	—	—	—	—	—	—	—	—	—	—
Acids, Organic	16	—	—	—	—	—	—	—	—	—	—
Sulfur & Compounds	13	—	—	—	—	—	—	45.2	—	—	—
Paint & Enamel	10	—	—	—	—	—	—	—	—	—	—
Dust, Siliceous	8	—	—	—	—	—	—	62.5	—	—	—
Lead & Compounds	7	—	—	—	—	—	—	—	—	—	—
Lacquer & Varnish	5	—	—	—	—	—	—	—	—	—	—
Alcohols, Esters & Ethers	2	—	—	—	—	—	—	—	—	—	—
Dyes	2	—	—	—	—	—	—	—	—	—	—
Fluorine & Compounds	2	—	—	—	—	—	—	—	—	—	—
Halogenated Hydrocarbons	1	—	—	—	—	—	—	—	—	—	—

NOC - Not otherwise classified.
Dash (—) indicates less than 0.1%.
"Other Methods" includes separators to prevent
personal contact with material; outside work;
combustible gas indicator.

Iron and Steel

The iron and steel industry was subdivided into manufacture of agricultural implements, construction of automobile bodies and parts, automobile repair shops (garages), steel rolling and fabrication such as bridge girder or other structural forms, car and railroad shops, and other and not specified operations dealing with iron and steel. Such agricultural implements as planting and fertilizing machinery, plows, cultivators, harvesting machinery, threshers, etc. come under the first category. Tractors are not included, but come under "other and not specified". Under construction of automobile bodies and parts were mostly truck and bus body building operations.

Tables 26 and 26a show the exposures for this class of industry. The term "other metals and compounds" includes iron and steel, as it denotes the metals other than lead, antimony, chromium, and cadmium which were given separate classification. From Table 26 it will be noted that 10,912 workers in all types of plants under this classification were covered by the survey and that the greatest number of exposures were to other metals and compounds, numbering 72.9%. The table shows further that the greatest number of exposures in each type of plant was greatest to this material except in automobile repair shops where a higher percentage of the workers (79.4%) were exposed to carbon monoxide. The exposure to dermatitis producers was fairly high in the industry as a whole (21.3%) primarily because cutting oils and compounds are used quite extensively. The exposure to siliceous dust is higher in this group than in all others except

"metals other than iron and steel", 19.1% of all workers surveyed being exposed. The use of sand in metal cleaning operations and the exposures to molding and core sand in the foundries undoubtedly account for this relatively high rate of exposure. The high exposure rate (38.9%) to this type of dust in the steel rolling and fabrication division is due to the fact that one steel mill where silica rock is added in the manufacture of pig iron was included in the survey. This fact also accounts for the high rate of exposure to excess heat in this division. It is probable that these figures are not representative of the entire division as most plants in this division deal with fabrication only, and not the manufacturing of pig iron.

Of the gases, carbon monoxide led the list with other gases a close second. Under the latter category come those gases arising from welding operations, of particular importance being the oxides of nitrogen.

The exposures to other materials in the schedule were all less than 10% for the industry as a whole. However, in the automobile bodies and parts division, the exposure to organic solvents was quite high (14.7%) and in the automobile repair shop division the exposure to the same material was very high (77.4%). The use of quick drying paints, lacquers and enamels and degreasing agents in these plants accounts for these high rates. These vapors are disseminated throughout the shop by room air currents thereby exposing practically all workmen even though they may not be directly associated with the process.

Table 26a shows the distribution of the exposures among the various divisions of the industry. For example, of the 7,961 exposures to other metals and compounds, 564 or 7.3% occurred in the agricultural implement group; 28 or 0.4% in automobile bodies and parts; 27 or 0.3% in automobile repair shops; etc. Obviously, the greatest number of exposures to those materials common to all divisions of the industry occurred in the division having the most number of workers covered by the survey, i.e. the "other and not specified" group. However, for those materials not common to all groups more exposures may occur in some of the smaller groups. For example, 63 exposures to sulfur dioxide occurred in the car and railroad repair shops whereas 57 occurred in the "other and not specified" division. Likewise, 45 of the 46 exposures to organic acids occurred in the car and railroad repair shops. However, from Table 26 the exposure rate to this material was only 8.6% for this division of the industry.

Local exhaust and negative ventilation were the most prevalent types of control measures observed for the workers in this industry as indicated by Table 26b. Under "other methods" are classified those workrooms that were normally operated with windows open; the use of sterilized cutting oils as a dermatitis preventive measure in machine work; the use of protective skin cream for the same purpose; and the installation of condenser sections in vapor degreasing tanks. The latter is typical of this type of tank as its proper operation depends upon a condenser for changing the degreasing

agent from vapor to liquid phase thereby permitting its use over and over. However, since these condensers are an important factor from the hygienic standpoint, they were regarded as a control measure. In regard to the exposures to siliceous dusts it will be noted that 2.3% of the workers used respirators whereas only 0.7% used pressure helmets.

Other Metals & Compounds	750	2.5
Nonmetallic Products	270	0.9
Nonmetallic Products, 100	270	0.9
Carbon Compounds	250	0.8
Dust, Siliceous	200	0.7
Other Gases	200	0.7
Fluorine Gas	150	0.5
Dust, Non-siliceous	80	0.3
Dust, Organic	70	0.2
Dust, Siliceous	40	0.1
Gels, Gums & Resins	40	0.1
Organic Solvents, 100	30	0.1
Dust, Coal, Anthracene	20	0.1
Paints & Varnishes	20	0.1
Alkaline Compounds	15	0.1
Alloy Metals	15	0.1
Acids & Varnishes	10	0.1
Acids, Mineral	10	0.1
Lead & Compounds	5	0.1
Alcohols, Esters & Ethers	5	0.1
Chemicals, Inorganic, 100	5	0.1
Quarries	5	0.1
Acids, Organic	5	0.1
Dust, Asbestos	5	0.1
Chemicals, Organic, 100	5	0.1
Halogenated Hydrocarbons	5	0.1
Coal Tar Products	5	0.1
Analytical Chemicals	5	0.1
Antimony & Compounds	5	0.1
Mercury & Compounds	5	0.1
Lead	5	0.1
Alloy	5	0.1
Aluminum & Compounds	5	0.1
Alloys	5	0.1
Aldehydes	5	0.1
Refined Materials	5	0.1

Materials	Number and	
	All Plants	
NUMBER OF WORKERS SURVEYED	10912	
	No.	%
Other Metals & Compounds	7961	72.9
Petroleum Products	2356	21.5
Dermatitis Producers, NOC	2329	21.3
Carbon Monoxide	2142	19.6
Dust, Siliceous	2090	19.1
Other Gases	2000	18.3
Excess Heat	1806	16.5
Dust, Non-siliceous	895	8.2
Dust, Organic	783	7.2
Dust, Silicate	440	4.0
Oils, Fats & Waxes	416	3.8
Organic Solvents, NOC	383	3.5
Dust, Coal, Bituminous	318	2.9
Paint & Enamel	221	2.0
Alkaline Compounds	172	1.6
Sulfur Dioxide	163	1.5
Lacquer & Varnish	123	1.1
Acids, Mineral	100	0.9
Lead & Compounds	92	0.8
Alcohols, Esters & Ethers	68	0.6
Chemicals, Inorganic, NOC	66	0.6
Cyanides	49	0.4
Acids, Organic	46	0.4
Dust, Asbestos	30	0.3
Chemicals, Organic, NOC	22	0.2
Halogenated Hydrocarbons	22	0.2
Coal Tar Products	17	0.2
Analytical Chemicals	14	0.1
Antimony & Compounds	11	0.1
Chromium & Compounds	11	0.1
Dyes	9	—
Inks	7	—
Cadmium & Compounds	6	—
Medicinals	4	—
Aldehydes	2	—
Infectious Materials	1	—

Fig. 1-4 indicates less than 0.1%
all other materials classified.

TABLE 26

IRON AND STEEL - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to Specified Material in Each Industrial Subdivision

Materials	All Plants		Agricultural Implements		Automobile Bodies & Parts		Automobile Repair Shops		Steel Rolling & Fabrication		Car & Railroad Shops		Other & Not Specified	
NUMBER OF WORKERS SURVEYED	10912		832		68		53		324		523		9112	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Other Metals & Compounds	7961	72.9	534	70.2	28	65.2	27	51.0	311	96.0	307	58.5	6704	73.6
Petroleum Products	2356	21.5	69	8.3	3	4.4	14	26.4	14	4.3	22	4.2	2234	24.5
Dermatitis Producers, NOC	2329	21.3	98	11.8	3	4.4	13	24.5	4	1.2	46	8.8	2165	23.7
Carbon Monoxide	2142	19.6	132	15.9	16	23.5	42	79.4	92	28.4	84	16.0	1776	19.5
Dust, Siliceous	2090	19.1	82	9.9	1	1.5	4	7.5	126	38.9	12	2.3	1965	21.6
Other Gases	2000	18.3	107	12.9	13	19.1	8	15.1	84	25.9	109	20.8	1679	18.5
Excess Heat	1806	16.5	255	30.6	0	--	0	--	153	47.2	0	--	1398	15.4
Dust, Non-siliceous	896	8.2	23	2.8	14	20.6	0	--	0	--	2	0.4	857	9.4
Dust, Organic	783	7.2	150	18.0	24	35.3	4	7.5	21	6.5	125	23.8	459	5.0
Dust, Silicate	440	4.0	37	4.4	1	1.5	3	3.8	2	0.6	138	26.3	260	2.9
Oils, Fats & Waxes	416	3.8	36	4.3	1	1.5	0	--	7	2.2	16	3.0	356	3.9
Organic Solvents, NOC	383	3.5	47	5.7	10	14.7	41	77.4	23	7.1	11	2.1	251	2.8
Dust, Coal, Bituminous	318	2.9	34	4.1	8	11.8	0	--	71	21.9	51	9.7	154	1.7
Paint & Enamel	221	2.0	24	2.9	2	2.9	5	9.4	17	5.2	7	1.3	166	1.8
Alkaline Compounds	172	1.6	2	0.2	0	--	0	--	0	--	51	9.7	119	1.3
Sulfur Dioxide	163	1.5	31	3.7	8	11.8	0	--	4	1.2	63	12.0	57	0.6
Lacquer & Varnish	128	1.1	17	2.0	10	14.7	5	9.4	0	--	2	0.4	94	1.0
Acids, Mineral	100	0.9	2	0.2	2	2.9	1	1.9	0	--	23	4.4	72	0.8
Lead & Compounds	92	0.8	4	0.5	2	2.9	1	1.9	14	4.3	10	1.9	61	0.7
Alcohols, Esters & Ethers	68	0.6	0	--	10	14.7	0	--	0	--	1	0.2	57	0.6
Chemicals, Inorganic, NOC	66	0.6	1	0.1	2	2.9	0	--	0	--	0	--	63	0.7
Cyanides	49	0.4	2	0.2	2	2.9	0	--	0	--	2	0.4	43	0.5
Acids, Organic	46	0.4	0	--	0	--	0	--	0	--	45	8.6	1	--
Dust, Asbestos	30	0.3	0	--	0	--	0	--	0	--	0	--	30	0.3
Chemicals, Organic, NOC	22	0.2	0	--	0	--	0	--	0	--	0	--	22	0.2
Halogenated Hydrocarbons	22	0.2	1	0.1	0	--	0	--	0	--	0	--	21	0.2
Coal Tar Products	17	0.2	0	--	0	--	0	--	0	--	3	0.6	14	0.2
Analytical Chemicals	14	0.1	0	--	0	--	0	--	0	--	0	--	14	0.2
Antimony & Compounds	11	0.1	0	--	0	--	0	--	0	--	0	--	11	0.1
Chromium & Compounds	11	0.1	0	--	0	--	0	--	0	--	0	--	11	0.1
Dyes	9	--	0	--	0	--	0	--	0	--	0	--	9	0.1
Inks	7	--	0	--	0	--	0	--	0	--	0	--	7	0.1
Cadmium & Compounds	6	--	0	--	0	--	0	--	0	--	0	--	6	0.1
Medicinals	4	--	0	--	0	--	0	--	0	--	0	--	4	--
Aldehydes	2	--	0	--	0	--	0	--	0	--	2	0.4	0	--
Infectious Materials	1	--	0	--	0	--	0	--	0	--	0	--	1	--

Dash (--) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 26a

IRON AND STEEL - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Total Exposures to Specified Materials in Each Industrial Subdivision

Materials	Number of Workers Exposed to Specified Materials	Agricultural Implements		Automobile Bodies & Parts		Automobile Repair Shops		Steel Rolling & Fabrication		Car & Railroad Shops		Other & Not Specified	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Other Metals & Compounds	7961	584	7.3	23	0.4	27	0.3	311	3.9	307	3.9	6704	84.4
Petroleum Products	2356	69	2.9	3	0.1	14	0.6	14	0.6	22	0.9	2234	94.7
Dermatitis Producers, NOC	2329	98	4.2	3	0.1	13	0.5	4	0.1	46	2.0	2165	93.0
Carbon Monoxide	2142	132	6.2	16	0.7	42	2.0	92	4.3	84	3.9	1776	87.2
Dust, Siliceous	2090	82	3.9	1	—	4	0.2	126	6.0	12	0.6	1965	94.2
Other Gases	2000	107	5.3	13	0.7	8	0.4	84	4.2	109	5.5	1679	84.1
Excess Heat	1806	255	14.1	0	—	0	—	153	8.5	0	—	1398	77.6
Dust, Non-siliceous	896	23	2.2	14	1.6	0	—	0	—	2	0.2	857	95.6
Dust, Organic	783	150	19.2	24	3.1	4	0.5	21	2.7	125	16.0	459	58.7
Dust, Silicate	440	37	8.4	1	0.2	2	0.5	2	0.5	138	31.4	260	59.2
Oils, Fats & Waxes	416	36	8.7	1	0.2	0	—	7	1.7	16	3.9	356	85.6
Organic Solvents, NOC	383	47	12.3	10	2.6	41	10.7	23	6.0	11	2.9	251	65.7
Dust, Coal, Bituminous	318	34	10.7	8	2.8	0	—	71	22.3	51	16.0	154	48.5
Paint & Enamel	221	24	10.9	2	0.9	5	2.3	17	7.7	7	3.2	166	75.2
Alkaline Compounds	172	2	0.1	0	—	0	—	0	—	51	29.6	119	69.3
Sulfur Dioxide	163	31	19.0	8	4.9	0	—	4	2.5	63	38.6	57	35.0
Lacquer & Varnish	128	17	13.3	10	7.8	5	3.9	0	—	2	1.6	94	73.5
Acids, Mineral	100	2	2.0	2	2.0	1	1.0	0	—	23	23.0	72	72.0
Lead & Compounds	92	4	4.4	2	2.2	1	1.1	14	15.2	10	10.9	61	66.4
Alcohols, Esters & Ethers	68	0	—	10	14.7	0	—	0	—	1	1.5	57	83.8
Chemicals, Inorganic, NOC	66	1	1.5	2	3.0	0	—	0	—	0	—	63	95.4
Cyanides	49	2	4.1	2	4.1	0	—	0	—	2	4.1	43	87.8
Acids, Organic	46	0	—	0	—	0	—	0	—	45	97.8	1	2.2
Dust, Asbestos	30	0	—	0	—	0	—	0	—	0	—	30	100.0
Chemicals, Organic, NOC	22	0	—	0	—	0	—	0	—	0	—	22	100.0
Halogenated Hydrocarbons	22	1	4.5	0	—	0	—	0	—	0	—	21	95.5
Coal Tar Products	17	0	—	0	—	0	—	0	—	3	17.6	14	82.4
Analytical Chemicals	14	0	—	0	—	0	—	0	—	0	—	14	100.0
Antimony & Compounds	11	0	—	0	—	0	—	0	—	0	—	11	100.0
Chromium & Compounds	11	0	—	0	—	0	—	0	—	0	—	11	100.0
Dyes	9	0	—	0	—	0	—	0	—	0	—	9	100.0
Inks	7	0	—	0	—	0	—	0	—	0	—	7	100.0
Cadmium & Compounds	6	0	—	0	—	0	—	0	—	0	—	6	100.0
Medicinals	4	0	—	0	—	0	—	0	—	0	—	4	100.0
Aldehydes	2	0	—	0	—	0	—	0	—	2	100.0	0	—
Infectious Materials	1	0	—	0	—	0	—	0	—	0	—	1	100.0

Dash (—) indicates less than 0.1%.
 NOC - Not otherwise classified.

TABLE 26b

PERCENT OF WORKERS IN IRON AND STEEL INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Percent of Workers Having Indicated Control

Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmet	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	25182	3.0	10.5	14.4	0.8	0.9	--	3.2	0.1	7.5	5.8
Other Metals & Compounds	7961	2.7	7.7	12.1	0.7	1.5	--	2.5	0.2	11.4	0.6
Petroleum Products	2356	0.2	7.6	4.5	--	--	--	0.5	--	1.0	6.8
Dermatitis Producers, NOC	2329	--	7.5	4.1	--	--	--	--	--	1.6	9.3
Carbon Monoxide	2142	2.7	13.9	20.9	1.4	--	--	0.6	--	--	1.5
Dust, Siliceous	2090	5.5	19.6	18.3	1.5	1.3	--	2.3	0.7	11.9	0.8
Other Gases	2000	2.1	16.0	18.3	3.8	0.1	--	0.7	--	--	1.6
Excess Heat	1806	1.1	14.4	1.5	--	--	--	--	--	--	46.8
Dust, Non-siliceous	896	1.6	2.8	28.6	--	0.3	--	7.9	--	10.6	0.7
Dust, Organic	783	13.7	18.1	31.7	1.8	--	--	11.9	--	14.2	--
Dust, Silicate	440	22.0	2.0	27.5	--	15.2	--	21.8	--	30.2	0.9
Oils, Fats & Waxes	416	0.4	28.6	28.4	--	--	--	0.2	--	4.1	--
Organic Solvents, NOC	383	1.3	3.9	23.5	--	--	--	11.2	--	3.9	1.0
Dust, Coal, Bituminous	318	21.4	18.2	18.6	--	--	--	0.9	--	26.7	12.0
Paint & Enamel	221	1.8	0.5	19.5	--	--	--	17.3	0.5	5.4	1.8
Alkaline Compounds	172	1.2	1.2	18.0	--	--	--	26.8	--	48.2	--
Sulfur Dioxide	163	--	--	35.0	--	1.2	--	1.8	--	--	17.2
Lacquer & Varnish	128	--	9.4	47.6	--	--	--	32.0	--	3.9	--
Acids, Mineral	100	--	7.0	22.0	--	--	--	1.0	--	30.0	--
Lead & Compounds	92	4.4	2.2	17.4	2.2	--	--	12.0	1.1	20.7	3.3
Alcohols, Esters & Ethers	68	--	11.8	42.6	--	--	--	44.2	--	--	--
Chemicals, Inorganic, NOC	66	--	--	9.1	--	--	--	1.5	--	9.1	3.0
Cyanides	49	--	--	77.5	--	--	--	2.0	--	26.5	--
Acids, Organic	46	--	--	--	--	--	--	97.8	--	97.8	--
Dust, Asbestos	30	--	--	--	--	--	--	--	--	--	--
Chemicals, Organic, NOC	22	--	--	--	--	--	--	--	--	--	--
Halogenated Hydrocarbons	22	--	--	--	--	--	--	--	--	--	100.0
Coal Tar Products	17	--	--	--	--	--	--	17.6	--	--	--
Analytical Chemicals	14	--	--	6.4	--	--	--	--	--	--	--
Antimony & Compounds	11	--	--	--	--	--	--	--	--	--	--
Chromium & Compounds	11	--	--	100.0	--	--	--	--	--	54.5	36.4
Dyes	9	--	--	--	--	--	--	--	--	--	--
Inks	7	--	--	--	--	--	--	--	--	--	--
Cadmium & Compounds	6	--	--	33.3	--	--	--	--	--	83.3	--
Medicinals	4	--	--	--	--	--	--	--	--	--	--
Aldehydes	2	--	--	--	--	--	--	--	--	--	--
Infectious Materials	1	--	--	--	--	--	--	--	--	--	--

NOC - Not otherwise classified.

Dash (--) indicates less than 0.1%.

"Other Methods" includes open windows; sterilized cutting oils; outside work; condenser section for degreasing tank; protective skin cream.

Metal Industries (Except Iron and Steel)

This industry was divided into two subclasses, namely, brass mills and foundries and other metals, the latter classification including electro-metal plating plants operating separately from some other plant. The workers in the industry as a whole were exposed to 24 of the 46 major materials as shown in Tables 27 and 27a. Both subdivisions present a high exposure rate to other metals and compounds and a relatively high rate to siliceous dust. Due primarily to foundry operations in the brass mills and foundries division, the exposure rates to carbon monoxide, excess heat, and other gases were higher in this division whereas the exposure rates to inorganic chemicals, alkaline compounds, mineral acids, and cyanides were highest in the other metals group because of the operation of plating processes.

Table 27b shows the control measures observed in the plants representing this industry. Local exhaust ventilation was by far the most prevalent, having been provided to 30.2% of all exposed workers surveyed and running as high as 100% in the case of exposures to some of the materials. It is interesting to note that none of the plants surveyed employed respiratory protection equipment as a control measure.

Dark (—) indicates less than 0.1%
NS - Not otherwise classified.

TABLE 27

METAL INDUSTRIES (EXCEPT IRON AND STEEL) - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number and Percentage of Workers Exposed to the Specified Material in Each Industrial Subdivision					
	All Plants		Brass Mills & Foundries		Other Metals	
NUMBER OF WORKERS SURVEYED	169		153		16	
	No.	%	No.	%	No.	%
Other Metals & Compounds	151	89.4	135	88.2	16	100.0
Dust, Siliceous	76	45.0	71	46.4	5	31.2
Carbon Monoxide	55	32.5	55	35.9	0	--
Dermatitis Producers, NOC	45	26.6	45	29.4	0	--
Excess Heat	42	24.8	42	27.4	0	--
Petroleum Products	40	23.7	40	26.1	0	--
Other Gases	37	21.9	37	24.2	0	--
Dust, Non-siliceous	33	19.5	28	18.3	5	31.2
Dust, Organic	24	14.2	23	15.0	1	6.2
Chemicals, Inorganic, NOC	22	13.0	14	9.2	8	50.0
Oils, Fats & Waxes	19	11.2	19	12.4	0	--
Alkaline Compounds	17	10.1	8	5.2	9	56.2
Acids, Mineral	14	8.3	8	5.2	6	37.5
Cyanides	11	6.5	5	3.3	6	37.5
Lead & Compounds	10	5.9	8	5.2	2	12.5
Chemicals, Organic, NOC	9	5.3	9	5.9	0	--
Dust, Coal, Bituminous	7	4.1	7	4.6	0	--
Organic Solvents, NOC	6	3.5	5	3.3	1	6.2
Alcohols, Esters & Ethers	4	2.4	3	2.0	1	6.2
Chromium & Compounds	4	2.4	2	1.3	2	12.5
Sulfur & Compounds	4	2.4	0	--	4	25.0
Paint & Enamel	3	1.8	2	1.3	1	6.2
Antimony & Compounds	2	1.2	0	--	2	12.5
Lacquers & Varnish	1	0.6	0	--	1	6.2

Dash (--) indicates less than 0.1%.
 NOC - Not otherwise classified.

TABLE 27a

METAL INDUSTRIES (EXCEPT IRON AND STEEL) - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Material	Number and Percentage of Total Exposures to Specified Material in Each Industrial Subdivision			
		Brass Mills & Foundries		Other Metals	
		No.	%	No.	%
Other Metals & Compounds	151	135	89.4	16	10.6
Dust, Siliceous	76	71	93.4	5	6.6
Carbon Monoxide	55	55	100.0	0	—
Dermatitis Producers, NOC	45	45	100.0	0	—
Excess Heat	42	42	100.0	0	—
Petroleum Products	40	40	100.0	0	—
Halogenated Hydrocarbons	37	37	100.0	0	—
Dust, Non-siliceous	33	28	84.8	5	15.2
Dust, Organic	24	23	95.8	1	4.2
Chemicals, Inorganic, NOC	22	14	63.7	8	36.3
Oils, Fats & Waxes	19	19	100.0	0	—
Alkaline Compounds	17	8	47.0	9	53.0
Acids, Mineral	14	8	57.2	6	42.8
Cyanides	11	5	45.5	6	54.5
Lead & Compounds	10	8	80.0	2	20.0
Chemicals, Organic, NOC	9	9	100.0	0	—
Dust, Coal, Bituminous	7	7	100.0	0	—
Organic Solvents, NOC	6	5	83.3	1	16.7
Alcohols, Esters & Ethers	4	3	75.0	1	25.0
Chromium & Compounds	4	2	50.0	2	50.0
Sulfur & Compounds	4	4	100.0	0	—
Paint & Enamel	3	2	66.7	1	33.3
Antimony & Compounds	2	0	—	2	100.0
Lacquers & Varnish	1	0	—	1	100.0

Dash (—) indicates less than 0.1%.
 NOC - Not otherwise classified.

TABLE 87

PERCENT OF WORKERS IN

Materials

ALL SPECIFIED MATERIALS	1940	1945	1950	1955	1960	1965	1970
Other Metals & Compounds	121	—	100.0	100.0	—	0.5	—
Dust, Siliceous	70	0.5	0.5	0.5	—	0.5	—
Carbon Monoxide	50	0.5	10.0	10.0	—	—	—
Dermatitis Producers, NOC	40	—	—	10.0	—	—	—
Excess Heat	30	—	—	—	—	—	—
Petroleum Products	20	—	0.5	10.0	—	—	—
Other Gases	10	—	10.0	10.0	—	—	—
Dust, Non-siliceous	5	—	0.5	10.0	—	—	—
Dust, Organic	4	—	0.5	10.0	—	—	—
Chemicals, Inorganic, NOC	3	—	0.5	10.0	—	—	—
Oils, Fats & Waxes	2	—	10.0	10.0	—	—	—
Alkaline Compounds	1	—	0.5	10.0	—	—	—
Acids, Mineral	1	—	0.5	10.0	—	—	—
Cyanides	1	—	0.5	10.0	—	—	—
Lead & Compounds	1	—	—	—	—	—	—
Chemicals, Organic, NOC	1	—	—	10.0	—	—	—
Dust, Coal, Bituminous	1	—	10.0	—	—	—	—
Organic Solvents, NOC	1	—	—	100.0	—	—	—
Alcohols, Esters & Ethers	1	—	—	100.0	—	—	—
Chromium & Compounds	1	—	0.5	100.0	—	—	—
Sulfur & Compounds	1	—	—	—	—	—	—
Paint & Enamel	1	—	—	100.0	—	—	—
Antimony & Compounds	1	—	—	100.0	—	—	—
Lacquer & Varnish	1	—	—	100.0	—	—	—

Note: (—) indicates less than 0.5%.
 "Other Metals" include open vessels.
 NOC - Not otherwise classified.

TABLE 27b

PERCENT OF WORKERS IN METAL INDUSTRIES (EXCEPT IRON AND STEEL) EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Percent of Workers Having Indicated Control

Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	642	0.2	4.7	30.2	0.3	0.3	--	--	--	3.3	1.4
Other Metals & Compounds	151	--	3.3	31.1	0.7	0.7	--	--	--	1.3	--
Dust, Siliceous	76	--	5.3	35.5	1.3	--	--	--	--	--	3.9
Carbon Monoxide	55	--	12.7	34.6	--	--	--	--	--	--	5.5
Dermatitis Producers, NOC	45	--	--	17.8	--	--	--	--	--	--	--
Excess Heat	42	2.4	--	--	--	--	--	--	--	--	--
Petroleum Products	40	--	5.0	22.5	--	--	--	--	--	--	--
Other Gases	37	--	10.8	18.9	--	2.7	--	--	--	--	--
Dust, Non-siliceous	33	--	3.0	15.1	--	--	--	--	--	--	8.1
Dust, Organic	24	--	8.3	33.3	--	--	--	--	--	--	--
Chemicals, Inorganic, NOC	22	--	--	45.4	--	--	--	--	--	--	--
Oils, Fats & Waxes	19	--	10.5	63.2	--	--	--	--	--	9.1	--
Alkaline Compounds	17	--	--	17.6	--	--	--	--	--	29.4	--
Acids, Mineral	14	--	--	35.7	--	--	--	--	--	35.7	--
Cyanides	11	--	--	--	--	--	--	--	--	45.5	--
Lead & Compounds	10	--	--	--	--	--	--	--	--	--	--
Chemicals, Organic, NOC	9	--	--	88.9	--	--	--	--	--	--	--
Dust, Coal, Bituminous	7	--	14.3	--	--	--	--	--	--	--	--
Organic Solvents, NOC	6	--	--	100.0	--	--	--	--	--	--	--
Alcohols, Esters & Ethers	4	--	--	100.0	--	--	--	--	--	--	--
Chromium & Compounds	4	--	--	100.0	--	--	--	--	--	--	--
Sulfur & Compounds	4	--	--	--	--	--	--	--	--	50.0	--
Paint & Enamel	3	--	--	100.0	--	--	--	--	--	--	--
Antimony & Compounds	2	--	--	100.0	--	--	--	--	--	--	--
Lacquer & Varnish	1	--	--	100.0	--	--	--	--	--	--	--

Dash (--) indicates less than 0.1%.
 "Other Methods" include open windows.
 NOC - Not otherwise classified.

Leather Industry

Data on exposures in the leather industry are shown in Tables 28 and 28a. The industry was divided into four subdivisions, namely, harness and saddlery, shoe, tanneries, and miscellaneous, and exposures to 22 of the 46 major materials were recorded. The exposure to organic dusts was heaviest in this industry, practically one-half the workers being exposed in all plants. The exposure rate to infectious materials and chemical compounds was higher in tanneries, whereas the exposure rate to dyes was highest in the harness and saddlery division. The exposure rate to carbon monoxide was relatively low in all divisions.

As shown by Table 28b, protective clothing which includes gloves, goggles, aprons, etc., was the most prevalent type of control measure for this industry. Exhaust ventilation was used, however, for the control of some of the important materials such as organic solvents and siliceous dust.

Organic Solvents	11	2.0	0	—	10	2.0	0	—	21	2.0
Organic Compounds	6	1.0	0	7.0	1	0.7	0	—	0	—
Infectious Materials	5	0.5	0	—	0	—	0	0.5	0	0.5
Chemical Compounds	4	0.7	4	5.0	0	—	0	—	0	—
Siliceous Dust	4	0.7	4	0.5	0	—	0	—	0	—
Carbon Monoxide	3	0.5	0	—	0	—	0	—	0	—
Dyes	3	0.3	1	1.4	0	—	0	—	0	—
Other Materials	2	0.3	0	—	0	—	0	—	0	—

Note: (—) indicates less than 0.1%
 100 = 100% of workers classified.

TABLE 28

LEATHER - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to the
Specified Material in Each Industrial Subdivision

Materials	All Plants		Harness & Saddlery		Miscellaneous		Shoe Factories		Tanneries	
NUMBER OF WORKERS SURVEYED	609		71		141		333		64	
	No.	%	No.	%	No.	%	No.	%	No.	%
Dust, Organic	255	41.9	19	26.8	141	100.0	60	18.0	35	54.7
Organic Solvents, NOC	33	5.4	1	1.4	1	0.7	22	6.6	9	14.0
Infectious Materials	31	5.1	0	—	0	—	0	—	31	48.5
Eyes	20	3.3	14	19.7	0	—	4	1.2	2	3.2
oils, Fats & Waxes	18	3.0	7	9.9	0	—	11	3.3	0	—
Other Metals & Compounds	18	3.0	2	2.8	7	5.0	9	2.7	0	—
Dust, Siliceous	15	2.5	5	7.0	0	—	10	3.0	0	—
Chemicals, Inorganic, NOC	14	2.3	0	—	0	—	0	—	14	21.9
Acids, Mineral	13	2.1	0	—	0	—	0	—	13	20.3
Alkaline Compounds	13	2.1	0	—	0	—	0	—	13	20.3
Chemicals, Organic, NOC	13	2.1	0	—	0	—	0	—	13	20.3
Chromium & Compounds	13	2.1	0	—	0	—	0	—	13	20.3
Sulfur & Compounds	13	2.1	0	—	0	—	0	—	13	20.3
Paints	12	2.0	2	2.8	0	—	10	3.0	0	—
Paint & Enamel	11	1.8	0	—	0	—	0	—	11	17.2
Lacquers & Varnish	6	1.0	5	7.0	1	0.7	0	—	0	—
Formaldehyde Producers, NOC	5	0.8	0	—	0	—	3	0.9	2	3.2
Carbon Monoxide	4	0.7	4	5.6	0	—	0	—	0	—
Dust, Silicate	4	0.7	4	5.6	0	—	0	—	0	—
Coal Tar Products	3	0.5	0	—	0	—	3	0.9	0	—
Petroleum Products	3	0.5	1	1.4	0	—	0	—	2	3.2
Aniline & Compounds	2	0.3	0	—	0	—	0	—	2	3.2

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 28a

LEATHER - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to Specified Materials in Each Industrial Subdivision							
		Harness & Saddlery		Miscellaneous		Shoe Factories		Tanneries	
		No.	%	No.	%	No.	%	No.	%
Dust, Organic	255	19	7.5	141	55.3	60	23.5	35	13.7
Organic Solvents, NOC	33	1	3.0	1	3.0	22	66.7	9	27.3
Infectious Materials	31	0	—	0	—	0	—	31	100.0
Eyes	20	14	70.0	0	—	4	20.0	2	10.0
Oils, Fats & Waxes	18	7	39.0	0	—	11	61.0	0	—
Other Metals & Compounds	18	2	11.1	7	38.9	9	50.0	0	—
Dust, Siliceous	15	5	33.3	0	—	10	66.7	0	—
Chemicals, Inorganic, NOC	14	0	—	0	—	0	—	14	100.0
Acids, Mineral	13	0	—	0	—	0	—	13	100.0
Alkaline Compounds	13	0	—	0	—	0	—	13	100.0
Chemicals, Organic, NOC	13	0	—	0	—	0	—	13	100.0
Chromium & Compounds	13	0	—	0	—	0	—	13	100.0
Sulfur & Compounds	13	0	—	0	—	0	—	13	100.0
Inks	12	2	16.7	0	—	10	83.3	0	—
Paint & Enamel	11	0	—	0	—	0	—	11	100.0
Lacquers & Varnish	6	5	83.3	1	16.7	0	—	0	—
Dermatitis Producers, NOC	5	0	—	0	—	3	60.0	2	40.0
Carbon Monoxide	4	4	100.0	0	—	0	—	0	—
Dust, Silicate	4	4	100.0	0	—	0	—	0	—
Coal Tar Products	3	0	—	0	—	3	100.0	0	—
Petroleum Products	3	1	33.3	0	—	0	—	2	66.7
Aniline & Compounds	2	0	—	0	—	0	—	2	100.0

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

PERCENT OF WORKERS IN

Materials

ALL SPECIFIED MATERIALS

Dust, Organic
 Organic Solvents, NOC
 Infectious Materials
 Dyes
 Oils, Fats & Waxes
 Other Metals & Compounds
 Dust, Siliceous
 Chemicals, Inorganic, NOC
 Acids, Mineral
 Alkaline Compounds
 Chemicals, Organic, NOC
 Chromium & Compounds
 Sulfur & Compounds
 Inks
 Paint & Enamel
 Lacquers & Varnish
 Dermatitis Producers, NOC
 Carbon Monoxide
 Dust, Silicate
 Coal Tar Products
 Petroleum Products
 Aniline & Compounds

Dash (—) indicates less than 0.1%
 NOC - Not otherwise classified.

TABLE 28b

PERCENT OF WORKERS IN LEATHER INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Percent of Workers Having Indicated Control											
Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	527	0.4	0.4	5.5	0.4	—	—	0.8	—	18.4	—
Dust, Organic	255	0.4	0.4	6.7	—	—	—	0.8	—	—	—
Organic Solvents, NOC	33	3.0	—	9.1	6.1	—	—	3.0	—	—	—
Infectious Materials	31	—	—	—	—	—	—	—	—	—	—
Dyes	20	—	—	—	—	—	—	—	—	51.7	—
Oils, Fats & Waxes	18	—	—	—	—	—	—	—	—	—	—
Other Metals & Compounds	18	—	—	—	—	—	—	—	—	—	—
Dust, Siliceous	15	—	—	53.4	—	—	—	—	—	—	—
Chemicals, Inorganic, NOC	14	—	—	—	—	—	—	—	—	—	—
Acids, Mineral	13	—	—	—	—	—	—	—	—	100.0	—
Alkaline Compounds	13	—	—	—	—	—	—	—	—	100.0	—
Chemicals, Organic, NOC	13	—	—	—	—	—	—	—	—	100.0	—
Chromium & Compounds	13	—	—	—	—	—	—	—	—	100.0	—
Sulfur & Compounds	13	—	—	—	—	—	—	—	—	100.0	—
Inks	12	—	—	—	—	—	—	—	—	100.0	—
Paint & Enamel	11	—	—	—	—	—	—	—	—	—	—
Lacquers & Varnish	6	—	—	16.7	—	—	—	—	—	—	—
Dermatitis Producers, NOC	5	—	—	—	—	—	—	—	—	—	—
Carbon Monoxide	4	—	—	—	—	—	—	—	—	—	—
Dust, Silicate	4	—	25.0	—	—	—	—	—	—	—	—
Coal Tar Products	3	—	—	—	—	—	—	25.0	—	—	—
Petroleum Products	3	—	—	—	—	—	—	—	—	—	—
Aniline & Compounds	2	—	—	—	—	—	—	—	—	—	—

Dash (—) indicates less than 0.1%.
 NOC - Not otherwise classified.

Lumber and Furniture

Tables 29 and 29a show the exposures in the lumber and furniture industry divided into three subdivisions, furniture and casket manufacturing, saw and planing mills, and other woodworking plants. Exposures to 20 of the 46 major materials were found in this industry, the exposure rate to organic dust being naturally the highest in all divisions. The exposure rates to some of the more harmful materials such as carbon monoxide, lead, and siliceous dust were relatively low in this industry, all being less than 4%.

Exhaust ventilation was the only type of mechanical ventilation employed in the plants surveyed as shown by Table 29b. This type of system is highly advantageous from the standpoint of fire protection. The table also shows that the use of respirators ranks second to exhaust ventilation although the number of workers so protected was small. Other methods include the use of protective creams as a dermatitis preventive measure. Protective clothing, principally gloves, was also used primarily for this purpose.

Dash (—) indicates less than 0.1%
ND - Not otherwise classified.

TABLE 29

LUMBER AND FURNITURE - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to
Specified Material in Each Industrial Subdivision

Materials	All Plants		Furniture & Casket		Saw & Planing Mills		Other Woodwork	
NUMBER OF WORKERS SURVEYED	2228		233		1667		323	
	No.	%	No.	%	No.	%	No.	%
Dust, Organic	1863	83.7	102	43.8	1448	86.9	313	95.4
Other Metals & Compounds	181	8.1	89	38.2	56	3.4	36	11.0
Dermatitis Producers, NOC	138	6.2	27	11.6	106	6.4	5	1.5
Organic Solvents, NOC	125	5.6	13	5.6	85	5.1	27	8.2
Petroleum Products	114	5.1	19	8.2	90	5.4	5	1.5
Oils, Fats & Waxes	90	4.0	2	0.8	88	5.3	0	—
Dust, Siliceous	70	3.1	18	7.7	41	2.5	11	3.5
Dyes	59	2.6	4	1.7	0	—	55	16.8
Dust, Silicate	38	1.7	0	—	38	2.3	0	—
Lacquers & Varnish	35	1.6	13	5.6	10	0.6	12	3.7
Halogenated Hydrocarbons	29	1.3	0	—	29	1.7	0	—
Other Gases	28	1.3	11	4.7	10	0.6	7	2.1
Carbon Monoxide	26	1.2	11	4.7	10	0.6	5	1.5
Lead & Compounds	26	1.2	8	3.4	16	1.0	2	0.6
Alcohols, Esters & Ethers	23	1.0	1	0.4	22	1.3	0	—
Paint & Enamel	23	1.0	2	0.8	15	0.9	6	1.8
Coal Tar Products	14	0.6	0	—	1	—	13	4.0
Dust, Non-siliceous	13	0.6	5	2.1	8	0.5	0	—
Dust, Coal, Bituminous	12	0.5	0	—	10	0.6	2	0.6
Sulfur Dioxide	11	0.5	0	—	10	0.6	1	0.3

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 29a

TIMBER AND FURNITURE - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Material	Number and Percentage of Total Exposures to Specified Material in Each Industrial Subdivision					
		Furniture & Casket		Saw & Planing Mills		Other Woodwork	
		No.	%	No.	%	No.	%
Dust, Organic	1863	102	5.5	1448	77.7	313	16.8
Other Metals & Compounds	181	89	49.2	56	30.9	36	19.9
Dermatitis Producers, NOC	138	27	19.5	106	76.9	5	3.6
Organic Solvents, NOC	125	13	10.4	85	68.0	27	21.6
Petroleum Products	114	19	16.7	90	78.9	5	4.4
Oils, Fats & Waxes	90	2	2.2	88	97.8	0	—
Dust, Siliceous	70	18	25.7	41	58.6	11	15.7
Dyes	59	4	6.8	0	—	55	93.2
Dust, Silicate	38	0	—	38	100.0	0	—
Lacquers & Varnish	35	13	37.1	10	28.6	12	34.3
Halogenated Hydrocarbons	29	0	—	29	100.0	0	—
Other Gases	28	11	39.3	10	35.7	7	25.0
Carbon Monoxide	26	11	43.4	10	38.4	5	19.2
Lead & Compounds	26	8	30.8	16	61.5	2	7.7
Alcohols, Esters & Ethers	23	1	4.4	22	95.6	0	—
Paint & Enamel	23	2	8.7	15	65.2	6	26.1
Coal Tar Products	14	0	—	1	7.1	13	92.9
Dust, Non-siliceous	13	5	38.4	8	61.6	0	—
Dust, Coal, Bituminous	12	0	—	10	83.3	2	16.7
Sulfur Dioxide	11	0	—	10	90.9	1	9.1

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

PERCENT OF WORKERS IN I

Materials	Total Number of Exposures	1950- 1954	1955- 1959	1960- 1964	1965- 1969	1970- 1974
ALL SPECIFIED MATERIALS	1,000	1.1	2.1	22.2	2.2	—
Dust, Organic	1,000	—	—	22.2	2.0	—
Other Metals & Compounds	1,000	—	2.0	2.2	1.1	—
Dermatitis Producers, NOC	1,000	2.1	2.0	2.2	—	—
Organic Solvents, NOC	1,000	2.0	—	22.2	2.0	—
Petroleum Products	1,000	0.9	0.7	2.2	—	—
Oils, Fats & Waxes	1,000	1.0	0.01	2.2	2.21	—
Dust, Siliceous	1,000	—	—	2.2	—	—
Dyes	1,000	—	2.2	2.2	2.2	—
Dust, Silicate	1,000	—	—	2.2	—	—
Lacquers & Varnish	1,000	—	—	2.2	0.02	—
Halogenated Hydrocarbons	1,000	0.02	0.02	2.2	—	—
Other Gases	1,000	—	—	2.2	—	—
Carbon Monoxide	1,000	—	—	2.2	—	—
Lead & Compounds	1,000	—	—	2.2	1.22	—
Alcohols, Esters & Ethers	1,000	1.0	0.02	2.2	—	—
Paint & Enamel	1,000	—	—	2.2	2.27	—
Coal Tar Products	1,000	—	—	—	—	—
Dust, Non-siliceous	1,000	—	—	2.2	—	—
Dust, Coal, Bituminous	1,000	—	—	2.2	—	—
Sulfur Dioxide	1,000	—	—	2.2	—	—

Data (—) indicates less than 0.1%.

"Other Metals" includes protective skin care
and - the otherwise classified.

TABLE 29b

PERCENT OF WORKERS IN LUMBER AND FURNITURE INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Percent of Workers Having Indicated Control											
Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	2987	--	--	32.5	--	--	--	2.5	--	1.6	1.1
Dust, Organic	1863	--	--	35.0	--	--	--	0.2	--	--	--
Other Metals & Compounds	181	--	--	8.3	--	--	--	1.1	--	0.6	--
Dermatitis Producers, NOC	138	--	--	5.8	--	--	--	--	--	6.5	1.4
Organic Solvents, NOC	125	--	--	24.8	--	--	--	9.6	--	--	6.4
Petroleum Products	114	--	--	5.3	--	--	--	--	--	7.9	7.0
Oils, Fats & Waxes	90	--	--	15.6	--	--	--	13.3	--	10.0	6.7
Dust, Siliceous	70	--	--	61.5	--	--	--	--	--	--	--
Dyes	59	--	--	3.4	--	--	--	3.4	--	3.4	--
Dust, Silicate	38	--	--	61.6	--	--	--	--	--	--	--
Lacquers & Varnish	35	--	--	77.3	--	--	--	40.0	--	--	--
Halogenated Hydrocarbons	29	--	--	13.8	--	--	--	--	--	31.0	27.6
Other Gases	28	--	--	100.0	--	--	--	--	--	--	--
Carbon Monoxide	26	--	--	34.6	--	--	--	--	--	--	--
Lead & Compounds	26	--	--	65.4	--	--	--	46.1	--	--	--
Alcohols, Esters & Ethers	23	--	--	21.7	--	--	--	--	--	39.2	8.7
Paint & Enamel	23	--	--	34.8	--	--	--	78.3	--	--	--
Coal Tar Products	14	--	--	--	--	--	--	--	--	--	--
Dust, Non-siliceous	13	--	--	53.7	--	--	--	--	--	--	--
Dust, Coal, Bituminous	12	--	--	58.3	--	--	--	--	--	--	--
Sulfur Dioxide	11	--	--	63.6	--	--	--	--	--	--	--

Dash (--) indicates less than 0.1%.
 "Other Methods" includes protective skin cream.
 NOC - Not otherwise classified.

Paper, Printing, and Allied Industry

This industry was subdivided into three classes, namely, paper and pulp manufacture, paper box making, and printing and publishing. As may be seen from Tables 30 and 30a, the exposure to organic dust was greatest in the industry as a whole, but the exposure to other materials was greatest in some of the subdivisions. For instance, the exposure to lead and compounds was greatest in the printing and publishing division and to dermatitis producers in the paper box division. The exposure to inks was also relatively high in the printing and publishing industry as would be expected from a general knowledge of the nature of the work.

Table 30a shows that of the 204 exposures to lead and compounds, 99.5% occurred in the printing and publishing industry and Table 30 shows that 47.1% of the workers surveyed in this class of plant were exposed to this material. The exposure to hydrogen sulfide was quite high for this industry in respect to the other industries studied. All of the exposures, however, occurred in the paper and pulp division as the gas is incidental to the process of paper manufacture. Exposures were least variable in the paper box division, there being only five of the 46 major materials listed. Eighteen materials were found in paper and pulp plants and 27 in printing and publishing.

Table 30b shows that local exhaust ventilation was the most widely used control measure, with negative ventilation ranking second. About one-third of the workers exposed to lead and its compounds were provided with local exhaust ventilation. As will be noticed, personal respiratory protection equipment was not observed in any of the plants surveyed.

TABLE 30

PAPER, PRINTING AND ALLIED - EXPOSURE TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to Specified Material in Each Industrial Subdivision

Materials	All Plants		Paper & Pulp		Paper Box		Printing & Publishing	
NUMBER OF WORKERS SURVEYED	696		218		47		431	
	No.	%	No.	%	No.	%	No.	%
Dust, Organic	230	33.0	97	44.5	9	19.1	124	28.8
Lead & Compounds	204	29.3	0	—	1	2.1	203	47.1
Inks	136	19.5	11	5.0	10	21.3	115	26.7
Dermatitis Producers, NOC	108	15.5	45	20.6	21	44.7	42	9.8
Other Metals & Compounds	81	11.6	27	12.4	0	—	54	12.5
Hydrogen Sulfide	70	10.0	70	32.1	0	—	0	—
Alkaline Compounds	49	7.0	48	22.0	0	—	1	0.2
Carbon Monoxide	49	7.0	6	2.7	6	12.8	37	8.6
Petroleum Products	45	6.5	45	20.6	0	—	0	—
Excess Humidity	33	4.7	33	15.1	0	—	0	—
Sulfur & Compounds	27	3.9	27	12.4	0	—	0	—
Chemicals, Inorganic, NOC	24	3.4	10	4.6	0	—	14	3.2
Organic Solvents, NOC	24	3.4	8	3.7	0	—	16	3.7
Other Gases	24	3.4	6	2.7	0	—	18	4.2
Excess Heat	22	3.2	21	9.6	0	—	1	0.2
Alcohols, Esters & Ethers	21	3.0	0	—	0	—	21	4.9
Oils, Fats & Waxes	19	2.7	11	5.0	0	—	8	1.9
Antimony & Compounds	17	2.4	0	—	0	—	17	3.9
Acids, Mineral	15	2.2	0	—	0	—	15	3.5
Dust, Silicate	12	1.7	8	3.7	0	—	4	0.9
Dust, Coal, Bituminous	7	1.0	6	2.7	0	—	1	0.2
Sulfur Dioxide	6	0.9	6	2.7	0	—	0	—
Acids, Organic	4	0.6	0	—	0	—	4	0.9
Chemicals, Organic, NOC	4	0.6	0	—	0	—	4	0.9
Cyanides	3	0.4	0	—	0	—	3	0.7
Dust, Siliceous	2	0.3	0	—	0	—	2	0.5
Dust, Non-siliceous	2	0.3	0	—	0	—	2	0.5
Dyes	2	0.3	0	—	0	—	2	0.5
Lacquers & Varnish	2	0.3	0	—	0	—	2	0.5
Cadmium & Compounds	1	0.1	0	—	0	—	1	0.2
Chromium & Compounds	1	0.1	0	—	0	—	1	0.2
Paint & Enamel	1	0.1	0	—	0	—	1	0.2

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 30a

PAPER, PRINTING AND ALLIED - EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to Specified Material in Each Industrial Subdivision					
		Paper & Pulp		Paper Box		Printing & Publishing	
		No.	%	No.	%	No.	%
Dust, Organic	230	97	42.1	9	3.2	124	45.3
Lead & Compounds	204	0	--	1	0.5	203	99.5
Inks	136	11	8.1	10	7.4	115	84.5
Dermatitis Producers, NOC	108	45	41.7	21	19.4	42	38.9
Other Metals & Compounds	81	27	33.3	0	--	54	66.7
Hydrogen Sulfide	70	70	100.0	0	--	0	--
Alkaline Compounds	49	48	98.0	0	--	1	2.0
Carbon Monoxide	49	6	12.2	6	12.2	37	75.6
Petroleum Products	45	45	100.0	0	--	0	--
Excess Humidity	33	33	100.0	0	--	0	--
Sulfur & Compounds	27	27	100.0	0	--	0	--
Chemicals, Inorganic, NOC	24	10	41.6	0	--	14	58.4
Organic Solvents, NOC	24	8	33.3	0	--	16	66.7
Other Gases	24	6	25.0	0	--	18	75.0
Excess Heat	22	21	95.5	0	--	1	4.5
Alcohols, Esters & Ethers	21	0	--	0	--	21	100.0
Oils, Fats & Waxes	19	11	57.9	0	--	8	42.1
Antimony & Compounds	17	0	--	0	--	17	100.0
Acids, Mineral	15	0	--	0	--	15	100.0
Dust, Silicate	12	8	66.7	0	--	4	33.3
Dust, Coal, Bituminous	7	6	85.7	0	--	1	14.3
Sulfur Dioxide	6	6	100.0	0	--	0	--
Acids, Organic	4	0	--	0	--	4	100.0
Chemicals, Organic, NOC	4	0	--	0	--	4	100.0
Cyanides	3	0	--	0	--	3	100.0
Dust, Siliceous	2	0	--	0	--	2	100.0
Dust, Non-siliceous	2	0	--	0	--	2	100.0
Dyes	2	0	--	0	--	2	100.0
Lacquers & Varnish	2	0	--	0	--	2	100.0
Cadmium & Compounds	1	0	--	0	--	1	100.0
Chromium & Compounds	1	0	--	0	--	1	100.0
Paint & Enamel	1	0	--	0	--	1	100.0

Dash (--) indicates less than 0.1%.

NOC - Not otherwise classified.

PERCENT OF WORKERS IN

Materials

ALL SPECIFIED MATERIALS

Dust, Organic
Lead & Compounds
Inks
Dermatitis Producers, NOC
Other Metals & Compounds
Hydrogen Sulfide
Alkaline Compounds
Carbon Monoxide
Petroleum Products
Excess Humidity
Sulfur & Compounds
Chemicals, Inorganic, NOC
Organic Solvents, NOC
Other Gases
Excess Heat
Alcohols, Esters & Ethers
Oils, Fats & Waxes
Antimony & Compounds
Acids, Mineral
Dust, Silicate
Dust, Coal, Bituminous
Sulfur Dioxide
Acids, Organic
Chemicals, Organic, NOC
Cyanides
Dust, Siliceous
Dust, Non-siliceous
Dyes
Lacquers & Varnish
Cadmium & Compounds
Chromium & Compounds
Paint & Enamel

Each (—) indicates less than 0.1%.
"Other Methods" includes hand for
type and automatic electric hand
control for line type.
NOC - Not otherwise classified.

TABLE 30b

PERCENT OF WORKERS IN PAPER, PRINTING AND ALLIED INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF CONTROL

Materials	Total Number of Exposures	Percent of Workers Having Indicated Control					Personal Respiratory Protection				
		Ventilation		Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
		Positive	Negative								
ALL SPECIFIED MATERIALS	1245	3.9	8.9	15.0	0.4	0.2	--	--	--	1.0	0.8
Dust, Organic	230	--	11.3	12.2	--	1.3	--	--	--	--	--
Lead & Compounds	204	--	7.3	33.8	1.0	--	--	--	--	--	2.0
Inks	136	--	1.5	0.7	--	--	--	--	--	1.5	--
Dermatitis Producers, NOC	108	--	--	--	0.9	--	--	--	--	--	5.6
Other Metals & Compounds	81	--	2.5	13.6	--	--	--	--	--	1.2	--
Hydrogen Sulfide	70	--	--	--	--	--	--	--	--	--	--
Alkaline Compounds	49	--	51.0	2.0	--	--	--	--	--	2.0	--
Carbon Monoxide	49	--	10.2	20.4	--	--	--	--	--	--	--
Petroleum Products	45	--	--	--	--	--	--	--	--	--	--
Excess Humidity	33	91.0	--	--	--	--	--	--	--	--	--
Sulfur & Compounds	27	--	89.0	--	--	--	--	--	--	--	--
Chemicals, Inorganic, NOC	24	--	4.2	33.3	--	--	--	--	--	4.2	--
Organic Solvents, NOC	24	--	4.2	25.0	--	--	--	--	--	--	--
Other Gases	24	--	--	12.5	--	--	--	--	--	--	--
Excess Heat	23	81.7	--	4.5	--	--	--	--	--	--	--
Alcohols, Esters & Ethers	21	--	--	--	--	--	--	--	--	9.5	--
Oils, Fats & Waxes	19	--	5.3	21.0	--	--	--	--	--	--	--
Antimony & Compounds	17	--	17.7	94.1	11.8	--	--	--	--	--	--
Acids, Mineral	15	--	--	53.3	--	--	--	--	--	6.7	--
Dust, Silicate	12	--	--	83.3	--	--	--	--	--	--	--
Dust, Coal, Bituminous	7	--	--	--	--	--	--	--	--	--	--
Sulfur Dioxide	6	--	--	--	--	--	--	--	--	--	--
Acids, Organic	4	--	--	25.0	--	--	--	--	--	--	--
Chemicals, Organic, NOC	4	--	--	25.0	--	--	--	--	--	--	--
Cyanides	3	--	33.3	66.7	--	--	--	--	--	33.3	--
Dust, Siliceous	2	--	--	100.0	--	--	--	--	--	50.0	--
Dust, Non-siliceous	2	--	50.0	50.0	--	--	--	--	--	50.0	--
Dyes	2	--	--	--	--	--	--	--	--	--	--
Lacquers & Varnish	2	--	50.0	50.0	--	--	--	--	--	--	--
Cadmium & Compounds	1	--	100.0	100.0	--	--	--	--	--	100.0	--
Chromium & Compounds	1	--	100.0	100.0	--	--	--	--	--	100.0	--
Paint & Enamel	1	--	100.0	100.0	--	--	--	--	--	--	--

Dash (--) indicates less than 0.1%.
 "Other Methods" includes hood for
 type saw; automatic electric heat
 control for glue pots.
 NOC - Not otherwise classified.

Textile

Tables 31 and 31a show 16 material exposures in this group, 11 occurring in woolen mills. The samples representing knitting mills, and mattress and other textile plants, were too small to be indicative; and the sample of tent and awning shops may not have been truly representative because one of the three places surveyed carried on roof building and repair work along with tent and awning manufacture. This plant, incidentally, accounts for the high exposure rates to coal tar products, dermatitis producers, and silicate dust, because these materials were associated with the roofing work.

Table 31b shows that 28.6% of the exposures occurred in processes carried on out-of-doors. Control measures for these exposures were classified under other methods. A few of the workers were provided with local exhaust ventilation.

Blank (---) indicates less than 0.1%
ND - Not otherwise classified.

TABLE 31

TEXTILE - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to
Specified Material in Each Industrial Subdivision

Materials	All Plants		Knitting Mills		Woolen Mills		Sewing & Tent		Mattress & Other Textile	
NUMBER OF WORKERS SURVEYED	109		4		71		23		6	
	No.	%	No.	%	No.	%	No.	%	No.	%
Dust, Organic	84	77.0	4	100.0	68	95.7	6	21.4	6	100.0
Coal Tar Products	15	13.8	0	—	0	—	14	50.0	1	16.7
Dermatitis Producers, NOC	14	12.8	0	—	0	—	14	50.0	0	—
Dust, Silicate	14	12.8	0	—	0	—	14	50.0	0	—
Organic Solvents, NOC	10	9.2	0	—	7	9.9	2	7.1	1	16.7
Oils, Fats & Waxes	8	7.3	0	—	8	11.3	0	—	0	—
Alcohols, Esters & Ethers	5	4.6	0	—	5	7.0	0	—	0	—
Alkaline Compounds	5	4.6	0	—	5	7.0	0	—	0	—
Acids, Mineral	3	2.8	0	—	3	4.2	0	—	0	—
Carbon Monoxide	3	2.8	0	—	3	4.2	0	—	0	—
Dust, Coal, Bituminous	3	2.8	0	—	3	4.2	0	—	0	—
Other Gases	3	2.8	0	—	3	4.2	0	—	0	—
Sulfur Dioxide	3	2.8	0	—	3	4.2	0	—	0	—
Dyes	2	1.8	0	—	2	2.8	0	—	0	—
Other Metals & Compounds	2	1.8	0	—	0	—	2	7.1	0	—
Paint & Enamel	2	1.8	0	—	0	—	2	7.1	0	—

Dash (—) indicates less than 0.1%.
NOC - Not otherwise classified.

TABLE 31a

TEXTILE - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to Specified Materials in Each Industrial Subdivision							
		Knitting Mills		Woolen Mills		Awning & Tent		Mattress & Other Textile	
		No.	%	No.	%	No.	%	No.	%
Dust, Organic	84	4	4.8	68	80.8	6	7.2	6	7.2
Coal Tar Products	15	0	—	0	—	14	93.3	1	6.7
Dermatitis Producers, NOC	14	0	—	0	—	14	100.0	0	—
Dust, Silicate	14	0	—	0	—	14	100.0	0	—
Organic Solvents, NOC	10	0	—	7	70.0	2	20.0	1	10.0
Oils, Fats & Waxes	8	0	—	8	100.0	0	—	0	—
Alcohols, Esters & Ethers	5	0	—	5	100.0	0	—	0	—
Alkaline Compounds	5	0	—	5	100.0	0	—	0	—
Acids, Mineral	3	0	—	3	100.0	0	—	0	—
Carbon Monoxide	3	0	—	3	100.0	0	—	0	—
Dust, Coal, Bituminous	3	0	—	3	100.0	0	—	0	—
Other Gases	3	0	—	3	100.0	0	—	0	—
Sulfur Dioxide	3	0	—	3	100.0	0	—	0	—
Dyes	2	0	—	2	100.0	0	—	0	—
Other Metals & Compounds	2	0	—	0	—	2	100.0	0	—
Paint & Enamel	2	0	—	0	—	2	100.0	0	—

Dash (—) indicates less than 0.1%.
 NOC - Not otherwise classified.

PERCENT OF WORK

Materials	Total	Respiratory Protection	Hand Protection	Foot Protection	Eye Protection	Head Protection	Other Protection
ALL SPECIFIED MATERIALS	100	5.0	1.5	2.5	—	—	—
Dust, Organic	50	—	—	—	—	—	—
Coal Tar Products	15	—	—	—	—	—	—
Dermatitis Producers, NOC	10	—	—	—	—	—	—
Dust, Silicate	10	—	—	—	—	—	—
Organic Solvents, NOC	10	—	—	—	—	—	—
Oils, Fats & Waxes	5	—	—	—	—	—	—
Alcohols, Esters & Ethers	5	—	—	—	—	—	—
Alkaline Compounds	5	—	—	—	—	—	—
Acids, Mineral	5	—	—	—	—	—	—
Carbon Monoxide	5	—	—	—	—	—	—
Dust, Coal, Bituminous	5	—	—	—	—	—	—
Other Gases	5	—	—	—	—	—	—
Sulfur Dioxide	5	—	—	—	—	—	—
Dyes	5	—	—	—	—	—	—
Other Metals & Compounds	5	—	—	—	—	—	—
Paint & Enamel	5	—	—	—	—	—	—

Foot (—) indicates less than 5.0.
 "Other Methods" included outside work.
 NOC - NOC otherwise classified.

TABLE 31b

PERCENT OF WORKERS IN TEXTILE INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF CONTROL

Percent of Workers Having Indicated Control

Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	176	—	1.1	9.7	—	—	—	3.4	—	8.5	23.8
Dust, Organic	84	—	—	3.6	—	—	—	7.2	—	3.6	—
Coal Tar Products	15	—	6.7	—	—	—	—	—	—	—	93.3
Dermatitis Producers, NOC	14	—	—	—	—	—	—	—	—	—	100.0
Dust, Silicate	14	—	—	—	—	—	—	—	—	—	100.0
Organic Solvents, NOC	10	—	10.0	40.0	—	—	—	—	—	30.0	—
Oils, Fats & Waxes	8	—	—	—	—	—	—	—	—	—	—
Alcohols, Esters & Ethers	5	—	—	60.0	—	—	—	—	—	60.0	—
Alkaline Compounds	5	—	—	60.0	—	—	—	—	—	60.0	—
Acids, Mineral	3	—	—	100.0	—	—	—	—	—	100.0	—
Carbon Monoxide	3	—	—	—	—	—	—	—	—	—	—
Dust, Coal, Bituminous	3	—	—	—	—	—	—	—	—	—	—
Other Gases	3	—	—	—	—	—	—	—	—	—	—
Sulfur Dioxide	3	—	—	—	—	—	—	—	—	—	—
Dyes	2	—	—	—	—	—	—	—	—	—	—
Other Metals & Compounds	2	—	—	—	—	—	—	—	—	—	—
Paint & Enamel	2	—	—	50.0	—	—	—	—	—	—	—

Dash (—) indicates less than 0.1%.

"Other Methods" includes outside work.

NOC - Not otherwise classified.

Miscellaneous Manufacturing Industries

This group was divided into broom and brush factories, button factories, electric light and power plants, electrical machinery and supplies manufacture, independent hand trades, rubber, and other miscellaneous which includes optical glass grinding, fountain pen and pencil manufacturing, advertising and display signs and novelties. There were exposures to 36 of the 46 major materials in the entire industry.

From Table 32 it will be seen that exposures to organic dusts were greatest in both the broom and brush and the rubber division, and exposures to non-siliceous dust were highest in the button industry. In the light and power division, the exposure rate was high to the various gases, such as carbon monoxide, sulfur dioxide and others. Exposures to lead and its compounds were found only in the electrical machinery and supply division and were associated primarily with battery manufacture. The table shows 5.2% of the workers in this division were exposed to this material.

Table 32a shows that 49.4% of the exposures to organic dust occurred in the "other miscellaneous" division and 31.4% in the "rubber goods" division. The highest number of exposures (553) to non-siliceous dust was in button manufacturing and the highest number to siliceous dust (12) occurred in the "other miscellaneous" plants.

Table 32b shows the control measures for this industry. Local exhaust was the most prevalent type observed particularly for

exposures to dusts. Other methods include exposures which occur out-of-doors and the installation of condenser sections in degreasing tanks. As explained previously, these condenser sections are more or less essential to vapor degreasing processes as they permit re-use of the solvent. Nevertheless, they are also a hygienic factor in that they decrease the amount of solvent vapor escaping into the room.

The use of respirators against exposures to lead and its compounds is quite significant in that 37.5% of the workers were provided with this type of control measure.

TABLE 51

INDUSTRIAL MANUFACTURING INDUSTRIES - CHAINING OFFICE

Number and Percentage of Workers Exposed to Various Materials

Materials	All Flour		Grain & Feed		Food & Kindred Products		Textile Mill		Lumber Yard	
	No.	%	No.	%	No.	%	No.	%	No.	%
NUMBER OF WORKERS SURVEYED										
Dust, Organic	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Other Metals & Compounds	701	22.8.00	701	22.8.00	701	22.8.00	701	22.8.00	701	22.8.00
Dust, Non-siliceous	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Organic Solvents, NOC	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Other Gases	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Dust, Silicate	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Chemicals, Organic, NOC	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Petroleum Products	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Inks	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Carbon Monoxide	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Dermatitis Producers, NOC	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Sulfur Dioxide	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Acids, Mineral	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Dust, Coal, Bituminous	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Excess Heat	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Lacquer & Varnish	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Chemicals, Inorganic, NOC	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Oils, Fats & Waxes	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Alkaline Compounds	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Paint & Enamel	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Sulfur & Compounds	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Dyes	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Accelerators	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Lead & Compounds	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Acids, Organic	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Halogenated Hydrocarbons	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Antimony & Compounds	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Coal Tar Products	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Dust, Siliceous	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Alcohols, Esters & Ethers	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Aldehydes	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Chromium & Compounds	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Analytical Chemicals	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Cyanides	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00
Mercury & Compounds	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00	224	22.8.00

Data (---) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 32

MISCELLANEOUS MANUFACTURING INDUSTRIES - EXPOSURES TO SPECIFIED MATERIALS

Number and Percentage of Workers Exposed to Specified Materials in Each Industrial Subdivision

Materials	All Plants		Broom & Brush		Buttons		Electric Light & Power		Electrical Machinery & Supply		Independent Hand Trades		Rubber Goods		Other Misc.	
NUMBER OF WORKERS SURVEYED	3006		74		802		207		455		5		296		1157	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Dust, Organic	894	29.8	73	98.7	93	11.6	3	1.5	4	0.9	0	—	230	94.6	441	38.2
Other Metals & Compounds	761	25.4	5	6.8	16	2.0	23	11.1	72	15.5	5	100.0	66	22.3	574	49.7
Dust, Non-siliceous	652	21.7	0	—	553	69.0	0	—	0	—	0	—	33	11.1	66	5.7
Organic Solvents, NOC	240	8.0	11	14.9	0	—	9	4.4	8	1.7	0	—	109	36.8	103	8.9
Other Gases	224	7.5	0	—	13	1.6	71	34.3	47	12.9	5	100.0	0	—	88	7.6
Dust, Silicate	195	6.5	8	10.8	27	3.4	9	4.4	4	0.9	0	—	120	40.5	27	2.3
Chemicals, Organic, NOC	157	5.2	0	—	14	1.7	8	3.9	3	0.6	0	—	25	8.4	107	9.2
Petroleum Products	140	4.7	4	5.4	16	2.0	45	21.7	10	2.1	0	—	18	6.1	47	4.1
Inks	134	4.5	0	—	0	—	0	—	0	—	0	—	2	0.7	152	11.4
Carbon Monoxide	133	4.4	0	—	6	0.7	68	32.9	20	4.3	5	100.0	8	2.6	25	2.2
Dermatitis Producers, NOC	123	4.1	5	6.8	3	0.4	36	17.4	10	2.1	0	—	10	3.4	59	5.1
Sulfur Dioxide	88	2.9	5	6.8	5	0.6	59	28.5	6	1.2	3	60.0	8	2.6	2	0.2
Acids, Mineral	76	2.5	0	—	11	1.4	0	—	46	9.9	0	—	0	—	19	1.6
Dust, Coal, Bituminous	64	2.1	0	—	6	0.7	44	21.3	1	0.2	3	60.0	8	2.6	2	0.2
Excess Heat	64	2.1	0	—	0	—	0	—	3	0.6	0	—	53	17.9	8	0.7
Lacquer & Varnish	53	1.8	7	9.5	0	—	9	4.4	5	1.1	0	—	0	—	32	2.8
Chemicals, Inorganic, NOC	51	1.7	5	6.8	0	—	0	—	19	4.1	0	—	17	5.7	10	0.9
Oils, Fats & Waxes	44	1.5	4	5.4	7	0.9	0	—	0	—	0	—	18	6.1	15	1.3
Alkaline Compounds	38	1.3	0	—	8	1.0	0	—	3	0.6	0	—	19	6.4	8	0.7
Paint & Enamel	37	1.2	4	5.4	0	—	0	—	9	1.9	0	—	0	—	24	2.1
Sulfur & Compounds	35	1.2	5	6.8	0	—	0	—	0	—	0	—	30	10.1	0	—
Dyes	31	1.0	11	14.9	4	0.5	0	—	0	—	0	—	14	4.7	2	0.2
Accelerators	25	0.8	0	—	0	—	0	—	0	—	0	—	25	8.4	0	—
Lead & Compounds	24	0.8	0	—	0	—	0	—	24	5.2	0	—	0	—	0	—
Acids, Organic	22	0.7	0	—	0	—	0	—	0	—	0	—	19	6.4	3	0.3
Halogenated Hydrocarbons	22	0.7	0	—	0	—	0	—	0	—	0	—	0	—	22	1.9
Antimony & Compounds	22	0.7	0	—	0	—	0	—	22	5.2	0	—	0	—	0	—
Coal Tar Products	20	0.7	1	1.4	10	1.2	0	—	0	—	0	—	0	—	9	0.8
Dust, Siliceous	18	0.6	4	5.4	0	—	0	—	3	0.4	0	—	0	—	12	1.0
Alcohols, Esters & Ethers	10	0.3	0	—	0	—	0	—	0	—	0	—	7	2.4	3	0.3
Aldehydes	7	0.2	0	—	7	0.9	0	—	0	—	0	—	0	—	0	—
Chromium & Compounds	5	0.2	0	—	0	—	0	—	0	—	0	—	0	—	5	0.4
Analytical Chemicals	5	0.2	0	—	0	—	3	1.9	0	—	0	—	0	—	2	2.1
Cyanides	2	—	0	—	0	—	0	—	0	—	0	—	0	—	2	2.1
Mercury & Compounds	1	—	0	—	0	—	0	—	1	0.2	0	—	0	—	0	—

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

TABLE 30a

Estimated Annual Production of Selected Chemicals and Allied Products - 1954

Estimated Annual Production of Selected Chemicals and Allied Products - 1954

Estimated Annual Production of Selected Chemicals and Allied Products - 1954

Materials

ALL PRODUCTION IS IN TONS

Dust, Organic
Other Metals & Compounds
Dust, Non-siliceous
Organic Solvents, NOC
Other Gases
Dust, Silicate
Chemicals, Organic, NOC
Petroleum Products
Inks
Carbon Monoxide
Dermatitis Producers, NOC
Sulfur Dioxide
Acids, Mineral
Dust, Coal, Bituminous
Excess Heat
Chemicals, Inorganic, NOC
Oils, Fats & Waxes
Alkaline Compounds
Paint & Enamel
Sulfur & Compounds
Medicinals
Dyes
Accelerators
Lead & Compounds
Acids, Organic
Halogenated Hydrocarbons
Antimony & Compounds
Lacquers & Varnish
Coal Tar Products
Dust, Siliceous
Alcohols, Esters & Ethers
Aldehydes
Chromium & Compounds
Analytical Chemicals
Cyanides
Mercury & Compounds

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
1999	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

TABLE 32a

MISCELLANEOUS MANUFACTURING INDUSTRIES - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to Specified Materials in Each Industrial Subdivision													
		Broom & Brush		Buttons		Electric Light & Power		Electrical Machinery & Supply		Independent Hand Trades		Rubber Goods		Other Misc.	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Dust, Organic	894	73	8.2	93	10.4	3	0.3	4	0.4	0	—	290	31.3	441	49.4
Other Metals & Compounds	761	5	0.7	16	2.1	23	3.0	72	9.5	5	0.7	66	8.7	574	75.3
Dust, Non-siliceous	652	0	—	553	84.8	0	—	0	—	0	—	33	5.1	66	10.1
Organic Solvents, NOC	240	11	4.6	0	—	9	3.8	8	3.3	0	—	109	45.4	103	42.9
Other Gases	234	0	—	13	5.8	71	31.7	47	21.0	5	2.2	0	—	88	39.3
Dust, Silicate	195	8	4.1	27	13.8	9	4.6	4	2.0	0	—	230	61.7	441	13.8
Chemicals, Organic, NOC	157	0	—	14	8.9	8	5.1	3	1.9	0	—	25	15.9	107	68.2
Petroleum Products	140	4	2.9	16	11.4	45	32.1	10	7.1	0	—	18	12.9	47	33.6
Inks	134	0	—	0	—	0	—	0	—	0	—	2	1.5	132	98.5
Carbon Monoxide	132	0	—	6	4.5	62	51.6	20	15.1	5	3.8	8	6.1	25	18.9
Dermatitis Producers, NOC	123	5	4.1	3	2.4	36	29.3	10	8.1	0	—	10	8.1	59	48.0
Sulfur Dioxide	89	5	5.7	5	5.7	59	67.0	6	6.8	3	3.4	8	9.1	2	2.3
Acids, Mineral	76	0	—	11	14.5	0	—	46	60.5	0	—	0	—	19	25.0
Dust, Coal, Bituminous	64	0	—	6	9.4	44	68.7	1	1.6	3	4.7	8	12.5	2	3.1
Excess Heat	64	0	—	0	—	0	—	3	4.7	0	—	53	83.8	8	12.5
Chemicals, Inorganic, NOC	51	5	9.8	0	—	0	—	19	37.3	0	—	17	33.3	10	19.6
Oils, Fats & Waxes	44	4	9.1	7	15.9	0	—	0	—	0	—	18	41.9	15	34.1
Alkaline Compounds	38	0	—	8	21.1	0	—	3	7.8	0	—	19	50.0	8	21.1
Paint & Enamel	37	4	10.8	0	—	0	—	9	24.3	0	—	0	—	24	64.9
Sulfur & Compounds	35	5	14.3	0	—	0	—	0	—	0	—	30	85.7	0	—
Medicinals	32	0	—	0	—	0	—	0	—	0	—	0	—	32	100.0
Dyes	31	11	35.5	4	12.9	0	—	0	—	0	—	14	45.1	2	6.5
Accelerators	25	0	—	0	—	0	—	0	—	0	—	25	100.0	0	—
Lead & Compounds	24	0	—	0	—	0	—	24	100.0	0	—	0	—	0	—
Acids, Organic	22	0	—	0	—	0	—	0	—	0	—	19	86.4	3	13.6
Halogenated Hydrocarbons	22	0	—	0	—	0	—	0	—	0	—	0	—	22	100.0
Antimony & Compounds	22	0	—	0	—	0	—	22	100.0	0	—	0	—	0	—
Lacquers & Varnish	21	7	33.3	0	—	9	32.9	5	23.8	0	—	0	—	0	—
Coal Tar Products	20	1	5.0	10	50.0	0	—	0	—	0	—	0	—	9	45.0
Dust, Siliceous	18	4	22.2	0	—	0	—	2	11.1	0	—	0	—	12	66.7
Alcohols, Esters & Ethers	10	0	—	0	—	0	—	0	—	0	—	7	70.0	3	30.0
Aldehydes	7	0	—	7	100.0	0	—	0	—	0	—	0	—	0	—
Chromium & Compounds	5	0	—	0	—	0	—	0	—	0	—	0	—	5	100.0
Analytical Chemicals	5	0	—	0	—	3	60.0	0	—	0	—	0	—	2	40.0
Cyanides	2	0	—	0	—	0	—	0	—	0	—	0	—	2	100.0
Mercury & Compounds	1	0	—	0	—	0	—	1	100.0	0	—	0	—	0	—

Dash (—) indicates less than 0.1%.
NOC - Not otherwise classified.

TABLE 32b

PERCENT OF WORKERS IN MISCELLANEOUS MANUFACTURING INDUSTRIES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Wet Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	4426	1.1	1.5	18.9	0.2	7.0	--	2.7	--	1.5	0.4
Dust, Organic	894	--	0.7	11.3	--	1.1	--	1.3	--	0.8	--
Other Metals & Compounds	761	--	--	12.0	--	5.0	--	1.1	0.3	3.8	--
Dust, Non-siliceous	652	--	0.2	39.1	--	37.2	--	--	--	--	--
Organic Solvents, NOC	240	3.7	5.4	14.2	--	--	--	12.9	--	4.2	--
Other Gases	224	3.1	--	12.5	--	--	--	1.8	--	--	--
Dust, Silicate	195	--	--	39.0	--	5.6	--	11.5	--	2.1	--
Chemicals, Organic, NOC	157	--	1.3	21.6	--	1.3	--	0.6	--	--	--
Petroleum Products	140	6.4	10.4	12.1	--	--	--	--	--	--	--
Inks	134	--	--	--	--	--	--	--	--	--	--
Carbon Monoxide	132	5.3	5.3	24.1	--	--	--	3.0	--	--	--
Dermatitis Producers, NOC	123	--	--	7.3	--	--	--	--	--	1.6	--
Sulfur Dioxide	89	9.0	--	19.3	5.4	--	2.3	4.5	--	--	--
Acids, Mineral	76	--	2.6	9.0	--	--	--	7.9	--	1.3	--
Dust, Coal, Bituminous	64	--	--	25.0	--	4.7	--	--	--	--	18.7
Excess Heat	64	--	--	--	--	--	--	--	--	--	--
Lacquer & Varnish	53	17.0	24.5	26.4	--	--	--	13.2	--	--	--
Chemicals, Inorganic, NOC	51	--	3.9	37.3	--	--	--	2.0	--	7.8	--
Oils, Fats & Waxes	44	--	--	50.0	--	--	--	--	--	--	--
Alkaline Compounds	39	--	--	26.3	--	--	--	--	--	10.5	--
Paint & Enamel	37	--	--	37.8	--	--	--	27.0	--	--	--
Sulfur & Compounds	35	--	--	25.7	17.1	--	--	--	--	--	--
Dyes	31	--	--	--	--	--	--	6.5	--	6.5	--
Accelerators	25	--	--	40.0	--	--	--	--	--	--	--
Lead & Compounds	24	--	--	37.5	--	--	--	37.5	--	20.8	16.7
Acids, Organic	22	--	9.1	--	--	--	--	--	--	--	--
Halogenated Hydrocarbons	22	--	--	4.5	--	--	--	--	--	--	9.1
Antimony & Compounds	22	--	--	--	--	--	--	--	--	--	--
Coal Tar Products	20	--	--	--	--	--	--	--	--	--	--
Dust, Siliceous	18	--	--	16.7	--	11.1	--	--	--	--	--
Alcohols, Esters & Ethers	10	--	20.0	--	--	--	--	--	--	--	--
Aldehydes	7	--	--	100.0	--	--	--	--	--	--	--
Chromium & Compounds	5	--	--	60.0	--	--	--	--	--	--	--
Analytical Chemicals	5	--	--	--	--	--	--	--	--	--	--
Cyanides	2	--	100.0	--	--	--	--	--	--	--	--
Mercury & Compounds	1	--	--	--	--	--	--	--	--	--	--

Dash (--) indicates less than 0.1%.
 "Other Methods" includes outside work;
 condenser section in degreasing tank.
 NOC - Not otherwise classified.

Domestic and Personal Service

Of this group only laundries and dry cleaning establishments were deemed sufficiently hazardous to be covered by the survey. The exposure data are presented in Tables 33 and 33a. Twenty of the 46 major materials were found, 16 being in the dry cleaning plants. The exposure rate to excess heat was greatest in dry cleaning and pressing shops whereas most exposures in laundries were to excess humidity. Other important exposures in dry cleaning were organic dusts, organic solvents, alkaline compounds, mineral and organic acids, halogenated hydrocarbons, alcohols, esters, and ethers, and other organic chemicals. Both divisions presented an average number of exposures to carbon monoxide gas.

As indicated by Table 33b, local exhaust ventilation was provided in those plants surveyed for 10.5% of the exposures to all specified materials and 33.3% of the exposures to organic solvents. Negative ventilation was also quite prevalent in this industry, particularly where exposures occurred to vapors. Those exposures occurring in shops which are usually operated with windows open were recorded under other methods, as the ventilating effect undoubtedly has some effect on the vapor concentration in the room even though such ventilation may not be ample in all cases.

TABLE 35

DOMESTIC AND PERSONAL SERVICE - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number and Percentage of Workers Exposed to Specified Materials in Each Industrial Subdivision					
	All Plants		Laundries		Cleaning & Pressing Shops	
NUMBER OF WORKERS SURVEYED	563		232		331	
	No.	%	No.	%	No.	%
Excess Heat	135	24.0	4	1.7	131	39.6
Dust, Organic	110	19.5	9	3.9	101	30.5
Organic Solvents, NOC	72	12.8	0	—	72	21.8
Alkaline Compounds	71	12.6	17	7.3	54	16.3
Carbon Monoxide	59	10.5	25	10.8	34	10.3
Acids, Mineral	49	8.7	2	0.9	47	14.2
Halogenated Hydrocarbons	48	8.5	0	—	48	14.5
Acids, Organic	47	8.4	0	—	47	14.2
Alcohols, Esters & Ethers	47	8.4	0	—	47	14.2
Chemicals, Organic, NOC	47	8.4	0	—	47	14.2
Excess Humidity	42	7.5	42	18.1	0	—
Other Gases	22	3.9	16	6.9	6	1.8
Oils, Fats & Waxes	8	1.4	0	—	8	2.4
Chemicals, Inorganic, NOC	6	1.1	4	1.7	2	0.6
Dust, Coal, Bituminous	5	0.9	5	2.2	0	—
Dust, Silicate	5	0.9	2	0.9	3	0.9
Sulfur Dioxide	5	0.9	5	2.2	0	—
Dyes	4	0.7	0	—	4	1.2
Dermatitis Producers, NOC	1	0.2	1	0.4	0	—
Petroleum Products	1	0.2	1	0.4	0	—

Dash (—) indicates less than 0.1%.
 NOC - Not otherwise classified.

TABLE 33a

DOMESTIC AND PERSONAL SERVICE - EXPOSURES TO SPECIFIED MATERIALS

Materials	Number of Workers Exposed to Specified Materials	Number and Percentage of Total Exposures to Specified Materials in Each Subdivision			
		Laundries		Cleaning & Pressing Shops	
		No.	%	No.	%
Excess Heat	135	4	3.0	131	97.0
Dust, Organic	110	9	8.2	101	91.8
Organic Solvents, NOC	72	0	—	72	100.0
Alkaline Compounds	71	17	24.0	54	76.0
Carbon Monoxide	59	25	42.4	34	57.6
Acids, Mineral	49	2	4.1	47	95.9
Halogenated Hydrocarbons	43	0	—	43	100.0
Acids, Organic	47	0	—	47	100.0
Alcohols, Esters & Ethers	47	0	—	47	100.0
Chemicals, Organic, NOC	47	0	—	47	100.0
Excess Humidity	42	42	100.0	0	—
Other Gases	22	16	72.7	6	27.3
Oils, Fats & Waxes	8	0	—	8	100.0
Chemicals, Inorganic, NOC	6	4	66.7	2	33.3
Dust, Coal, Bituminous	5	5	100.0	0	—
Dust, Silicate	5	2	40.0	3	60.0
Sulfur Dioxide	5	5	100.0	0	—
Dyes	4	0	—	4	100.0
Dermatitis Producers, NOC	1	1	100.0	0	—
Petroleum Products	1	1	100.0	0	—

Dash (—) indicates less than 0.1%.

NOC - Not otherwise classified.

NAME OF WORKER
PERCENT OF WORKERS IN
LOCATION

SAFETY PROTECTION

Materials

T
R
O
E

ALL SPECIFIED MATERIALS

Excess Heat
Dust, Organic
Organic Solvents, NOC
Alkaline Compounds
Carbon Monoxide
Acids, Mineral
Halogenated Hydrocarbons
Acids, Organic
Alcohols, Esters & Ethers
Chemicals, Organic, NOC
Excess Humidity
Other Gases
Oils, Fats & Waxes
Chemicals, Inorganic, NOC
Dust, Coal, Bituminous
Dust, Silicate
Sulfur Dioxide
Dyes
Dermatitis Producers, NOC
Petroleum Products

Each (---) indicates less than 0.1%
"Other Methods" include open flames,
etc. - See otherwise classified.

TABLE 33b

PERCENT OF WORKERS IN DOMESTIC AND PERSONAL SERVICES EXPOSED TO SPECIFIED MATERIALS HAVING INDICATED TYPE OF HAZARD CONTROL

Percent of Workers Having Indicated Control

Materials	Total Number of Exposures	Ventilation		Personal Respiratory Protection							
		Positive	Negative	Local Exhaust	Enclosed Process	Hot Methods	Gas Masks	Respirator	Pressure Helmets	Protective Clothing	Other Methods
ALL SPECIFIED MATERIALS	784	—	6.4	10.5	—	—	—	0.3	—	0.5	7.8
Excess Heat	135	—	—	—	—	—	—	—	—	—	—
Dust, Organic	110	—	14.5	12.7	—	—	—	0.9	—	—	7.3
Organic Solvents, NOC	72	—	9.7	33.3	—	—	—	—	—	—	12.5
Alkaline Compounds	71	—	5.6	14.1	—	—	—	—	—	4.2	11.2
Carbon Monoxide	59	—	—	—	—	—	—	—	—	—	—
Acids, Mineral	49	—	8.2	12.2	—	—	—	—	—	—	14.3
Halogenated Hydrocarbons	48	—	8.3	16.7	—	—	—	—	—	—	14.6
Acids, Organic	47	—	8.5	12.8	—	—	—	—	—	—	14.9
Alcohols, Esters & Ethers	47	—	8.5	12.8	—	—	—	—	—	—	14.9
Chemicals, Organic, NOC	47	—	8.5	12.8	—	—	—	—	—	—	14.9
Excess Humidity	42	—	—	—	—	—	—	—	—	—	—
Other Gases	22	—	9.1	4.5	—	—	—	—	—	—	4.5
Oils, Fats & Waxes	8	—	—	—	—	—	—	—	—	—	—
Chemicals, Inorganic, NOC	6	—	—	—	—	—	—	—	—	—	—
Dust, Coal, Bituminous	5	—	—	—	—	—	—	—	—	—	—
Dust, Silicate	5	—	—	—	—	—	—	—	—	—	—
Sulfur Dioxide	5	—	—	—	—	—	—	20.0	—	20.0	—
Dyes	4	—	23.0	—	—	—	—	—	—	—	—
Dermatitis Producers, NOC	1	—	—	—	—	—	—	—	—	—	—
Petroleum Products	1	—	—	—	—	—	—	—	—	—	—

Dash (—) indicates less than 0.1%.
 "Other Methods" include open windows.
 NOC - Not otherwise classified.

APPENDIX 1

INDUSTRIAL WELFARE DATA

NAME OF PLANT _____ DATE _____

LOCATION _____ SURVEYED BY _____

SAFETY PROVISIONS: Director: Full Time _____ Part Time _____

Shop Committees _____ Insurance _____

Others _____ None _____

MEDICAL PROVISIONS: Hospital _____ First Aid Room _____

First Aid Kit _____ Trained First Aid Worker _____

Physician: Full Time _____ Part Time _____

Nurse: Full Time _____ Part Time _____

No Provisions _____

SICK BENEFIT _____ SICKNESS RECORD _____

ACCIDENT RECORD _____ LABOR TURNOVER (Percent) _____

TOTAL NUMBER OF EMPLOYEES _____ Male _____ Female _____

OTHER REMARKS _____

Products Manufactured _____ Department _____

Persons Interviewed _____ Surveyed by _____ Date _____

[illegible]

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APPENDIX 111

MAJOR CONDITION AND MATERIAL CLASSIFICATION AND EXAMPLES OF MATERIALS INCLUDED

- | | |
|--------------------------------|-----------------------------|
| 1. Accelerators | Methyl Acetate |
| Aniline | Methyl Alcohol |
| 12. Ammonia Formaldehyde | Permatol |
| 11. Aniline Formaldehyde | Sta-Press |
| 12. Butraldehyde Aniline | Sulfuric Ether |
| 13. Butylaldehyde | Toxicol |
| Butylamine | Wood Alcohol |
| Butylamine Aniline | 5. Aldehydes |
| 14. Diorthotolylguanidine | Acrolein |
| Diphenylguanidine | Formaldehyde |
| Diphenylparatoluidine | Phenolic Resins |
| Hexamethylinetetramine | 6. Alkaline Compounds |
| Mercaptobenzathiozole | Ammonium Hydroxide |
| Methyleneparatoluidine | Barium Hydroxide |
| Paranitrosodimethylaniline | Barium Oxide |
| Paraphenylenediamine | Calcium Hydroxide |
| Piperidine | Calcium Oxide |
| Tetramethylthiurea Disulfide | Caustic Potash |
| Tetramethylthiurammonosulfide | Caustic Soda |
| Thiocarbamites | Cleaning Compounds |
| Thiocarbanilide | Lime |
| Toluidine | Mabex |
| Triphenylguanidine | Magnesium Oxide |
| 2. Acids, Mineral | Oakite |
| 12. Hydrochloric Acid | Portland Cement |
| Muriatic Acid | Potash |
| Nitric Acid | Potassium Carbonate |
| Phosphoric Acid | Potassium Hydroxide |
| 12. Sulfuric Acid | Sal Soda |
| 3. Acids, Organic | Soda Ash |
| Acetic Acid | Sodium Carbonate |
| Formic Acid | Sodium Hydroxide |
| Oxalic Acid | Sodium Hypochlorite |
| Picric Acid | Sodium Metaphosphate |
| Tannic Acid | Sodium Silicate |
| Vinegar | Trisodium Phosphate |
| 4. Alcohols, Esters and Ethers | Washing Powder |
| Amyl Acetate | Wyandotte Cleaner |
| Amyl Alcohol | 7. Analytical Chemicals |
| Butyl Acetate | Inorganic Chemical Reagents |
| Butyl Alcohol | Organic Chemical Reagents |
| Diethyl Ether | 8. Aniline and Compounds |
| Ethyl Acetate | Aniline |
| 12. Ethyl Alcohol | Acetanilide |
| Ethyl Ether | Dimethylaniline |
| Methanol | Paranitraniline |

APPENDIX 111 - Continued

MAJOR CONDITION AND MATERIAL CLASSIFICATION AND EXAMPLES OF MATERIALS INCLUDED

9. Antimony and Compounds	Dough
Antimony	Lard
Storage Battery Plates	Rustveto
10. Arsenic and Compounds	Starch
11. Cadmium and Compounds	Sugar
12. Carbon Monoxide	Syrup
13. Chemicals, Inorganic, NOC*	Tar
Brine	19. Dust, Asbestos
Chemicals, Inorganic	20. Dust, Coal, Anthracite
14. Chemicals, Organic, NOC	21. Dust, Coal, Bituminous
Aneroid	22. Dust, Siliceous
Beetle Ware	Agate
Calodorant	Chalcedony
Camphor	Cristobalite
Catalin	Diatomaceous Earth
Chemicals, Organic	Flint
Masuron	Gannister
Monite	Granite
Mothine	Infusorial Earth
Neoprene	Kieselguhr
Plaskon	Jasper
Pyralin	Onyx
Pyrethrum Products	Opal
Radite	Quartz
Thiokol	Sand
15. Chromium and compounds	Tridymite
Chromates	Tripoli
Chromic Acid	23. Dust, Silicate
Potassium Dichromate	Ashes
16. Coal Tar Products	Carborundum
Coal Tar	Clay
Creosote	Crystolon
Naphthalene	Feldspar
Phenol	Ferrosilicon
Phenolic Resins	Fire Clay
Pitch	Glass
Tar	Granite
17. Cyanides	Mica
Hydrocyanic Acid	Mortarmix
Hydrogen Cyanide	Portland Cement
Potassium Cyanide	Pumice
Prussic Acid	Silicon Carbide
Sodium Cyanide	Slate
18. Dermatitis Producers, NOC	Soapstone
Chocolate	Sodium Silicate
Cutting Compounds	Talc

*NOC - Not otherwise classified.

APPENDIX 111 - Continued

MAJOR CONDITION AND MATERIAL CLASSIFICATION AND EXAMPLES OF MATERIALS INCLUDED

24. Dust, Non-Siliceous

Alundum
 Aluminum Oxide
 Boron Carbide
 Corundum
 Emery
 Facemol
 Fuller's Earth
 Gypsum
 Limestone
 Magnesite
 Marble
 Partam
 Plaster of Paris
 Rouge

25. Dust, Organic

Amidex
 Carbon Black
 Catalin
 Celluloid
 Cotton
 Dextrin
 Dragon's Blood
 Durite
 Feathers
 Felt
 Fiber
 Fiberboard
 Fur
 Graphite
 Gums
 Hair
 Kapok
 Lampblack
 Leather
 Paper
 Rags
 Resins
 Rosin
 Rubber
 Ruscus
 Sawdust
 Sisal
 Spices
 Starch
 Straw

Tobacco

Wool

26. Dyes

Aniline Dyes
 Coal Tar Dyes
 Shoe Dye
 Stains

27. Excess Heat

28. Excess Humidity

29. Fluorine and Compounds

Calcium Fluoride
 Hydrofluoric Acid
 Hydrogen Fluoride
 Sodium Fluoride

30. Halogenated Hydrocarbons

Blacosolve
 Brominated Hydrocarbons
 Carbon Tetrachloride
 Chlorinated Hydrocarbons
 Chloroform
 Methyl Bromide
 Methyl Chloride
 Pentachlorophenol
 Perchloroethylene
 Permatol
 Tetrachlorethane
 Tetrachlorethylene
 Toxicol
 Trichlorethylene

31. Hydrogen Sulfide

32. Infectious Materials

Animal Hair
 Hides
 Serums
 Toxins
 Vaccines

33. Inks

Printers Ink
 Stencil Ink

34. Lacquer and Varnish

Duco
 Lacquers
 Liptol
 Shellac
 Varnishes

APPENDIX 111 - Continued

MAJOR CONDITION AND MATERIAL CLASSIFICATION AND EXAMPLES OF MATERIALS INCLUDED

- | | |
|---|---|
| <p>35. Lead and Compounds
 Babbitt Metal
 Lead
 Lead Paints
 Lead Salts
 Litharge
 Type Metal
 White Lead</p> <p>36. Medicinals
 Pharmaceuticals</p> <p>37. Mercury and Compounds</p> <p>38. Oils, Fats and Waxes
 Animal Fats and Oils
 Lard
 Tallow
 Vegetable Oils
 Waxes</p> <p>39. Organic Solvents, NOC
 Acetone
 Benzene
 Benzine
 Benzol
 Bronzing Liquid
 Cleaners' Liquids
 Furlite
 Gasoline
 Kerosene
 Leather Cement
 Liptol
 Naphtha
 Permatol
 Shellsol
 Spotex
 Stanisol
 Toluol
 Toxicol
 Turpentine
 Xylol</p> <p>40. Other Gases
 Acetylene
 Ammonia
 Benzene
 Carbon Dioxide
 Chlorine
 Nitrogen Oxides
 Ozone
 Sodium Hypochlorite</p> | <p>41. Other Metals and Compounds
 Aluminum and Compounds
 Brass
 Bronzing Liquid
 Bronzing Powder
 Copper and Compounds
 Iron Dust
 Iron Oxide
 Iron Pyrites
 Manganese and Compounds
 Metal Fumes
 Nickel and Compounds
 Pyrites
 Rouge
 Steel
 Titanium Oxide
 Zinc and Compounds
 Zinc Sulfide</p> <p>42. Paint and Enamel
 Enamels
 Japan Compounds
 Lead Paint
 Lithopone
 Paints
 Zinc Paint</p> <p>43. Petroleum Products
 Asphalt
 Cutting Oils
 Elasterite
 Greases
 Lubricants
 Lubricating Oil
 Mineral Oils
 Paraffin
 Permatol
 Pitch
 Rustveto
 Shellsol
 Stanisol
 Toxicol</p> <p>44. Phosphorus and Compounds</p> <p>45. Sulfur and Alkaline Sulfides
 Iron Pyrites
 Pyrites
 Sodium Sulfide
 Sulfur
 Zinc Sulfide</p> <p>46. Sulfur Dioxide</p> |
|---|---|

APPENDIX iv

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Accelerators	Accelerators
Acetic Acid	Acids, Organic
Acetone	Organic Solvents, NOC*
Acetylene	Other Gases
Acrolein	Aldehydes
Agate	Dust, Siliceous
Alcohols	Alcohols, Esters and Ethers
Alundum	Dust, Non-Siliceous
Aluminum	Other Metals and Compounds
Aluminum Oxide	Dust, Non-Siliceous
Ameroid	Chemicals, Organic, NOC
Anidex	Dust, Organic
Ammonia	Other Gases
Ammonium Hydroxide	Alkaline Compounds
Amyl Acetate	Alcohols, Esters and Ethers
Amyl Alcohol	Alcohols, Esters and Ethers
Aniline	Aniline and Compounds
Aniline Dyes	Dyes
Antimony	Antimony and Compounds
Ashes	Dust, Silicate
Asbestos	Dust, Asbestos
Asphalt	Petroleum Products
Babbitt Metal	Lead and Compounds
Barium Hydroxide	Alkaline Compounds
Benzene	Organic Solvents, NOC
Benzine	Other Gases
Benzol	Organic Solvents, NOC
Beetle Ware	Organic Solvents, NOC
Blacosolve	Chemicals, Organic, NOC
Boron Carbide	Halogenated Hydrocarbons
Brass	Dust, Non-Siliceous
Brine	Other Metals and Compounds
Brominated Hydrocarbons	Chemicals, Inorganic, NOC
Bronzing Liquid	Halogenated Hydrocarbons
Bronzing Powder	Other Metals and Compounds
Butyl Acetate	Organic Solvents, NOC
	Other Metals and Compounds
	Alcohols, Esters and Ethers

*NOC - Not otherwise classified.

APPENDIX iv - Continued

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Cadmium	Cadmium and Compounds
Calcium Carbide	Alkaline Compounds
Calcium Carbonate	Alkaline Compounds
Calcium Chloride	Chemicals, Inorganic, NOC
Calcium Fluoride	Fluorine and Compounds
Calcium Hydroxide	Alkaline Compounds
Calodorant	Chemicals, Organic, NOC
Camphor	Chemicals, Organic, NOC
Carbon Black	Dust, Organic
Carbon Dioxide	Other Gases
Carbon Monoxide	Carbon Monoxide
Carbon Tetrachloride	Halogenated Hydrocarbons
Carborundum	Dust, Silicate
Catalin	Chemicals, Organic, NOC
Caustic Potash	Dust, Organic
Caustic Soda	Alkaline Compounds
Celluloid	Alkaline Compounds
Cement, Leather	Dust, Organic
Cement, Portland	Organic Solvents, NOC
Cement, Rubber	Alkaline Compounds
Chalcedony	Dust, Silicate
Chemicals, Analytical	Organic Solvents, NOC
Chemicals, Inorganic	Dust, Siliceous
Chemicals, Organic	Salts
Chlorine	Chemicals, Inorganic, NOC
Chlorinated Hydrocarbons	Chemicals, Organic, NOC
Chloroform	Other Gases
Chocolate	Halogenated Hydrocarbons
Chromates	Halogenated Hydrocarbons
Chromic Acid	Dermatitis Producers, NOC
Clay	Chromium and Compounds
Cleaners' Liquids	Chromium and Compounds
Cleaning Compounds	Dust, Silicate
Coal Dust, Anthracite	Organic Solvents, NOC
Coal Dust, Bituminous	Alkaline Compounds
Coal Tar	Dust, Coal, Anthracite
Coal Tar Dyes	Dust, Coal, Bituminous
Coke	Coal Tar Products
Copper	Dyes
Corundum	Dust, Coal, Bituminous
Cotton	Other Metals and Compounds
Croosote	Dust, Non-Siliceous
	Dust, Organic
	Coal Tar Products

APPENDIX IV - Continued

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Cristobalite	Dust, Siliceous
Crystolon	Dust, Silicate
Cutting Compounds	Dermatitis Producers, NOC
Cutting Oils	Dermatitis Producers, NOC
Cyanides	Petroleum Products
	Cyanides
Dextrin	Dust, Organic
Diatomaceous Earth	Dust, Siliceous
Diethyl Ether	Alcohols, Esters and Ethers
Dough	Dermatitis Producers, NOC
Dragon's Blood	Dust, Organic
Duco	Dust, Organic
Durite	Lacquer and Varnish
Dust, Asbestos	Dust, Organic
Dust, Carborundum	Dust, Asbestos
Dust, Coal, Anthracite	Dust, Silicate
Dust, Coal, Bituminous	Dust, Coal, Anthracite
Dust, Emery	Dust, Coal, Bituminous
Dust, Non-Siliceous	Dust, Non-Siliceous
Dust, Organic	Dust, Non-Siliceous
Dust, Silicate	Dust, Organic
Dust, Silica	Dust, Silicate
Dust, Tripoli	Dust, Siliceous
Dyes	Dust, Siliceous
	Dyes
Elaterite	Petroleum Products
Emery	Dust, Non-Siliceous
Enamel	Paint and Enamel
Esters	Alcohols, Esters and Ethers
Ethers	Alcohols, Esters and Ethers
Ethyl Acetate	Alcohols, Esters and Ethers
Ethyl Alcohol	Alcohols, Esters and Ethers
Ethyl Ether	Alcohols, Esters and Ethers
Facemol	Dust, Non-Siliceous
Feathers	Dust, Organic
Feldspar	Dust, Silicate
Felt	Dust, Organic
Ferrosilicon	Dust, Silicate
Fiber	Dust, Organic
Fiberboard	Dust, Organic
Fire Clay	Dust, Silicate
Flint	Dust, Siliceous

APPENDIX IV - Continued

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Flour	Dust, Organic
Formaldehyde	Aldehydes
Fuller's Earth	Dust, Silicate
Furlite	Organic Solvents, NOC
Furs	Dust, Organic
Gannister	Dust, Siliceous
Gasoline	Organic Solvents, NOC
Garnet	Dust, Silicate
Glass	Dust, Silicate
Granite	Dust, Silicate
Graphite	Dust, Siliceous
Grease, Lubricating	Dust, Organic
Gums	Petroleum Products
Gypsum	Dust, Organic
Hair	Dust, Non-Siliceous
Halogenated Hydrocarbons	Dust, Organic
Hides (raw)	Infectious Materials
Hydrochloric Acid	Halogenated Hydrocarbons
Hydrocyanic Acid	Infectious Materials
Hydrofluoric Acid	Acids, Mineral
Hydrogen Cyanide	Cyanides
Hydrogen Fluoride	Fluorine and Compounds
Hydrogen Sulfide	Cyanides
Infusorial Earth	Fluorine and Compounds
Inks	Hydrogen Sulfide
Iron Dust	Dust, Siliceous
Iron Oxide	Inks
Iron Pyrites	Other Metals and Compounds
Japan Compounds	Other Metals and Compounds
Jasper	Other Metals and Compounds
Kaolin	Sulfur and Alkaline Sulfides
Kapok	Paint and Enamel
Kerosene	Dust, Siliceous
Kieselguhr	Dust, Silicate
	Dust, Organic
	Organic Solvents, NOC
	Dust, Siliceous

APPENDIX iv - Continued

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Lacquer	Lacquer and Varnish
Lampblack	Dust, Organic
Lard	Dermatitis Producers, NOC
	Oils, Fats and Waxes
Lead	Lead and Compounds
Lead Paint	Lead and Compounds
	Paint and Enamel
Lead Salts	Lead and Compounds
Litharge	Lead and Compounds
Leather	Dust, Organic
Leather Cement	Organic Solvents, NOC
Line	Alkaline Compounds
Limestone	Dust, Non-Siliceous
Liptol	Lacquer and Varnish
	Organic Solvents, NOC
Lithopone	Paint and Enamel
Lubricants	Petroleum Products
Mabex	Alkaline Compounds
	Other Gases
Magnesite	Dust, Non-Siliceous
Magnesium Oxide	Alkaline Compounds
Manganese and Compounds	Other Metals and Compounds
Marble	Dust, Non-Siliceous
Masuron	Chemicals, Organic, NOC
Mercury and Compounds	Mercury and Compounds
Methanol	Alcohols, Esters and Ethers
Methyl Acetate	Alcohols, Esters and Ethers
Methyl Alcohol	Alcohols, Esters and Ethers
Methyl Bromide	Halogenated Hydrocarbons
Methyl Chloride	Halogenated Hydrocarbons
Metal Fumes, NOC	Other Metals and Compounds
Nica	Dust, Silicate
Mineral Oils	Petroleum Products
Monite	Chemicals, Organic, NOC
Mortarmix	Dust, Silicate
Mothine	Chemicals, Organic, NOC
Muriatic Acid	Acids, Mineral
Naphtha	Organic Solvents, NOC
Naphthalene	Coal Tar Products
Neoprene	Chemicals, Organic, NOC

APPENDIX IV - Continued

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Nitrogen Oxides	Other Gases
Nickel and Compounds	Other Metals and Compounds
Nitric Acid	Acids, Mineral
Oakite	Alkaline Compounds
Oils, Animal	Oils, Fats and Waxes
Oils, Mineral	Petroleum Products
Oils, Vegetable	Oils, Fats and Waxes
Onyx	Dust, Siliceous
Opal	Dust, Siliceous
Oxalic Acid	Acids, Organic
Ozone	Other Gases
Paint	Paint and Enamel
Paint, Lead	Lead and Compounds
Paper	Paint and Enamel
Paraffin	Dust, Organic
Paratam	Petroleum Products
Pentachlorophenol	Dust, Non-Siliceous
Pernatol	Halogenated Hydrocarbons
Pharmaceuticals	Alcohols, Esters and Ethers
Phenol	Dermatitis Producers, NOC
Phenolic Resins	Halogenated Hydrocarbons
Phosphoric Acid	Oils, Fats and Waxes
Pitch	Organic Solvents, NOC
Plaskon	Petroleum Products
Plaster of Paris	Medicinals
Portland Cement	Coal Tar Products
Potash	Aldehydes
Potassium Carbonate	Coal Tar Products
Potassium Cyanide	Acids, Mineral
Potassium Dichromate	Coal Tar Products
Potassium Hydroxide	Chemicals, Organic, NOC
Printer's Ink	Dust, Non-Siliceous
Prussic Acid	Alkaline Compounds
	Dust, Silicate
	Alkaline Compounds
	Alkaline Compounds
	Cyanides
	Chromium and Compounds
	Alkaline Compounds
	Inks
	Cyanides

APPENDIX iv - Continued

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Pumice	Dust, Silicate
Pyralin	Chemicals, Organic, NOC
Pyrethrum Products	Chemicals, Organic, NOC
Pyrites	Other Metals and Compounds
	Sulfur and Alkaline Sulfides
Quartz	Dust, Siliceous
Radite	Chemicals, Organic, NOC
Rags	Dust, Organic
Resins	Dust, Organic
Rosin	Dust, Organic
Rouge	Dust, Non-Siliceous
Rubber	Other Metals and Compounds
Rubber Cement	Dust, Organic
Ruscus	Organic Solvents, NOC
Rustveto	Dust, Organic
	Dermatitis Producers
	Petroleum Products
Sal Soda	Alkaline Compounds
Sand	Dust, Siliceous
Sawdust	Dust, Organic
Serums	Infectious Materials
Shellac	Lacquer and Varnish
Shellsol	Organic Solvents, NOC
	Petroleum Products
Shoe Dye	Dyes
Silicon Carbide	Dust, Silicate
Sisal	Dust, Organic
Slate	Dust, Silicate
Soapstone	Dust, Silicate
Soda Ash	Alkaline Compounds
Sodium Carbonate	Alkaline Compounds
Sodium Chloride	Chemicals, Inorganic, NOC
Sodium Cyanide	Cyanides
Sodium Fluoride	Fluorine and Compounds
Sodium Hydroxide	Alkaline Compounds
Sodium Hypochlorite	Alkaline Compounds
	Other Gases
Sodium Metaphosphate	Alkaline Compounds
Sodium Silicate	Alkaline Compounds
	Dust, Silicate

APPENDIX iv - Continued

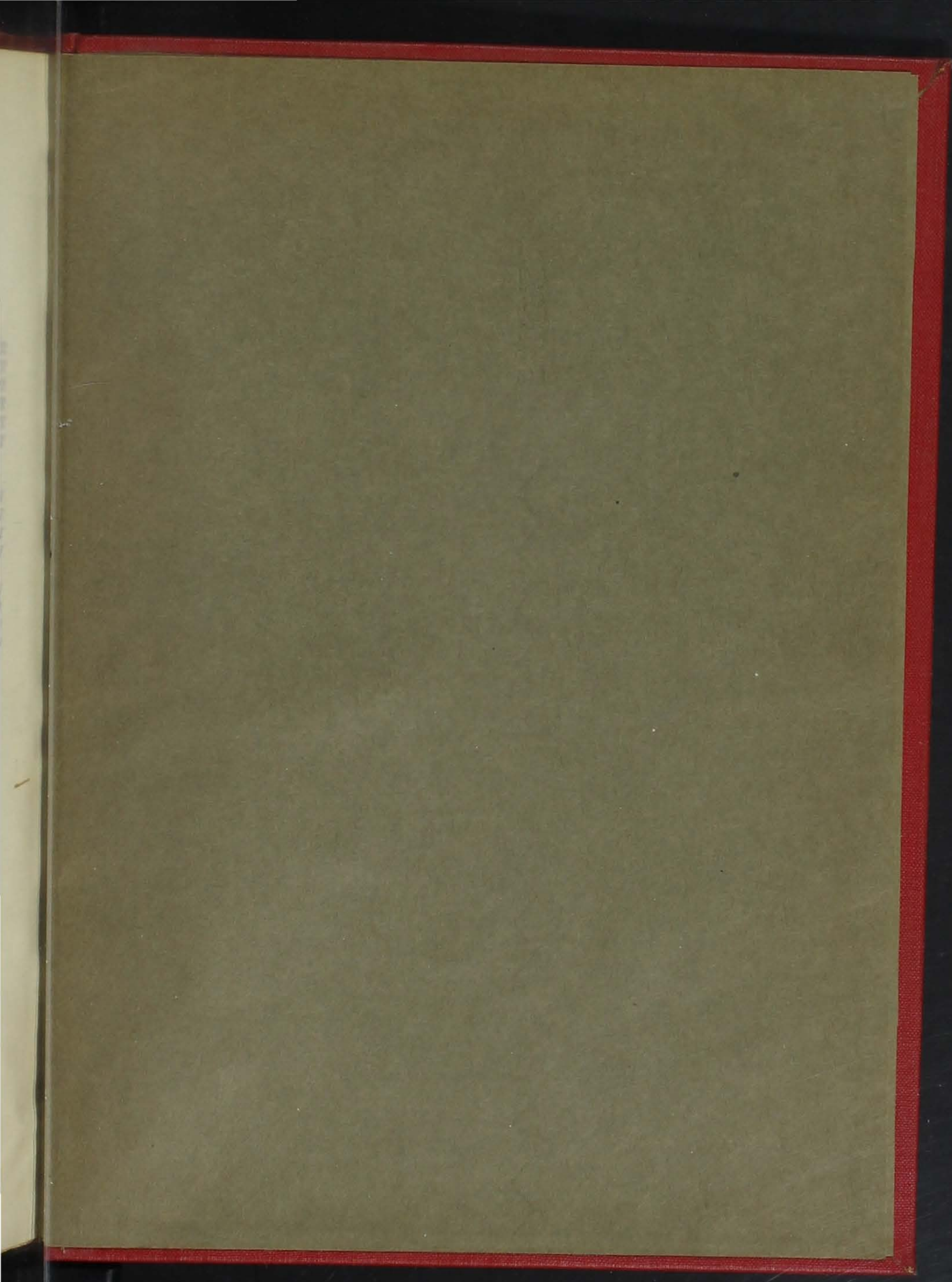
EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical list)

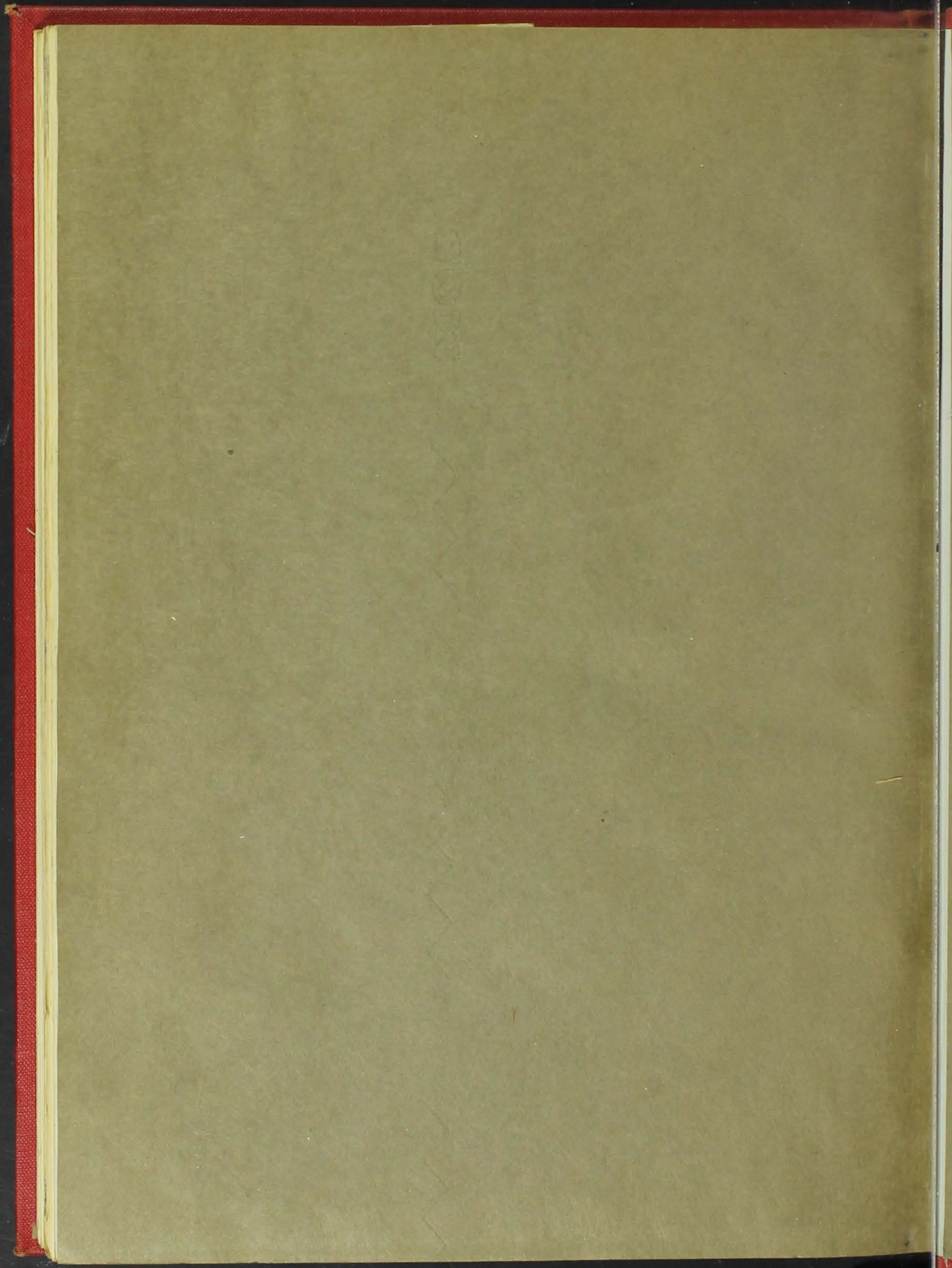
MATERIALS	CLASSIFICATION
Sodium Sulfide	Sulfur and Alkaline Sulfides
Sodium Thiosulfate	Chemicals, Inorganic, NOC
Spices	Dust, Organic
Spotex	Organic Solvents, NOC
Stains, Wood	Dyes
Stanisol	Organic Solvents, NOC
Sta-Press	Petroleum Products
Starch	Alcohols, Esters and Ethers
Steel	Oils, Fats and Waxes
Stencil Ink	Dermatitis Producers, NOC
Stink Damp	Dust, Organic
Straw	Other Metals and Compounds
Sugar	Inks
Sulfur	Hydrogen Sulfide
Sulfuric Acid	Dust, Organic
Sulfuric Ether	Dermatitis Producers, NOC
Sulfur Dioxide	Dust, Organic
Sulfuretted Hydrogen	Sulfur and Alkaline Sulfides
Syrup	Acids, Mineral
Talc	Alcohols, Esters and Ethers
Tallow	Sulfur Dioxide
Tannic Acid	Hydrogen Sulfide
Tar	Dermatitis Producers, NOC
Tetrachlorethane	Dust, Silicate
Tetrachlorethylene	Oils, Fats and Waxes
Thiokol	Acids, Organic
Titanium Oxide	Coal Tar Products
Tobacco	Dermatitis Producers, NOC
Toluol	Halogenated Hydrocarbons
Toxicol	Halogenated Hydrocarbons
Toxins	Chemicals, Organic, NOC
	Dust, Organic
	Other Metals and Compounds
	Dust, Organic
	Organic Solvents, NOC
	Alcohols, Esters and Ethers
	Dermatitis Producers, NOC
	Halogenated Hydrocarbons
	Oils, Fats and Waxes
	Organic Solvents, NOC
	Petroleum Products
	Infectious Materials

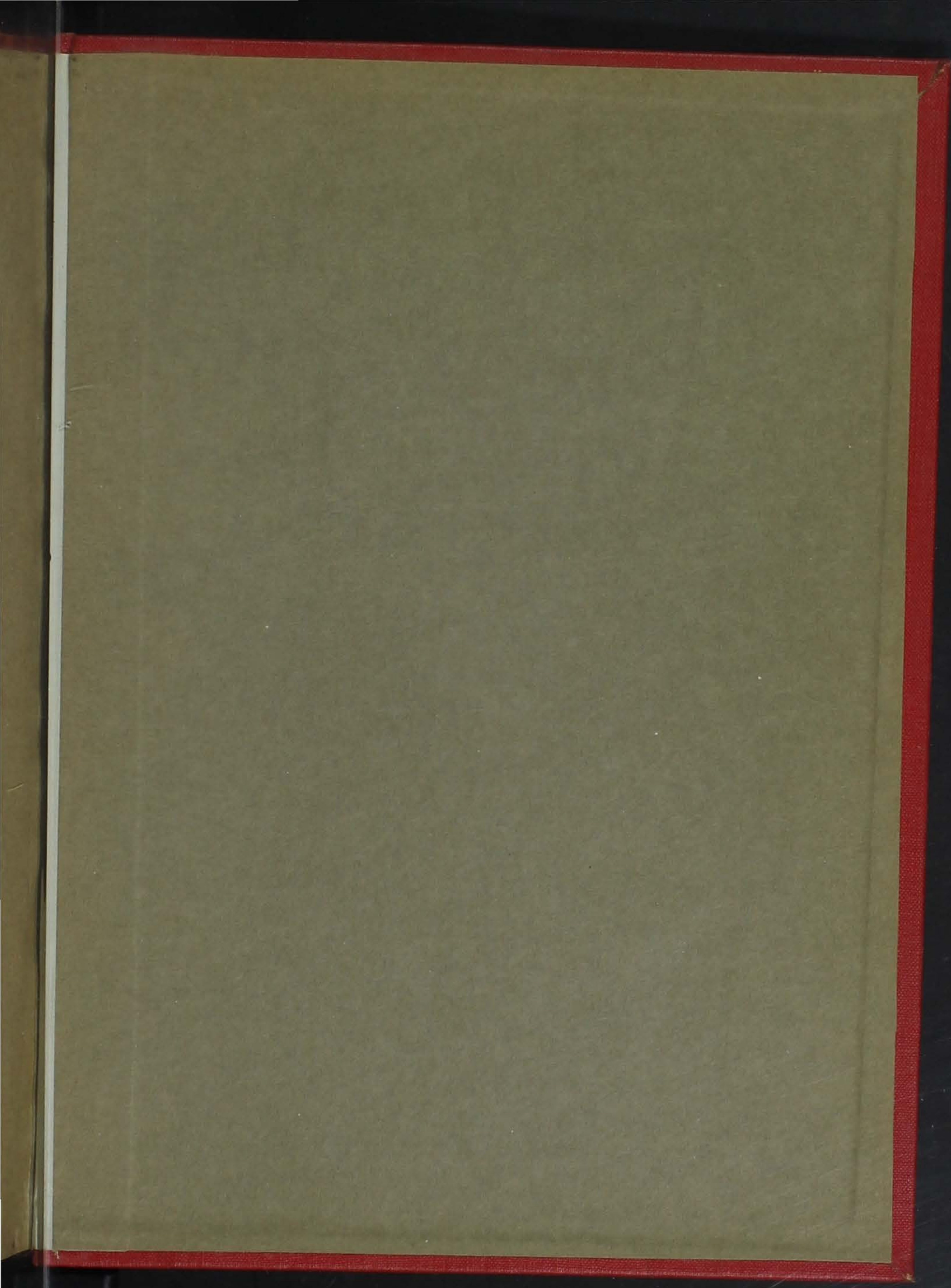
APPENDIX iv - Continued

EXAMPLES OF PRODUCTS INCLUDED UNDER MAJOR MATERIAL CLASSIFICATION
(Alphabetical List)

MATERIALS	CLASSIFICATION
Trichlorethylene	Halogenated Hydrocarbons
Tridymite	Dust, Siliceous
Tripoli	Dust, Siliceous
Trisodium Phosphate	Alkaline Compounds
Turpentine	Organic Solvents, NOC
Type Metal	Antimony and Compounds
	Lead and Compounds
Vaccines	Infectious Materials
Varnish	Lacquer and Varnish
Vegetable Oils	Oils, Fats and Waxes
Vinegar	Acids, Organic
Washing Powder	Alkaline Compounds
Waxes	Oils, Fats and Waxes
White Lead	Lead and Compounds
Wood Alcohol	Alcohols, Esters and Ethers
Wood Life	Alcohols, Esters and Ethers
	Dermatitis Producers, NOC
	Halogenated Hydrocarbons
	Oils, Fats and Waxes
	Organic Solvents, NOC
	Petroleum Products
Wood Stains	Dyes
Wool	Dust, Organic
Wyandotte Cleaner	Alkaline Compounds
Xylol	Organic Solvents, NOC
Zinc and Compounds	Other Metals and Compounds
Zinc Paint	Paint and Enamel
Zinc Sulfide	Other Metals and Compounds
	Sulfur and Alkaline Sulfides
Zolvit	Alkaline Compounds







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